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The Multidimensional Influences of Positive Emotions on Stress, Coping, Resilience, Wellness, and Work Engagement

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The Multidimensional Influences of Positive Emotions on Stress, Coping, Resilience, Wellness, and Work Engagement

by

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Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

May 2013

This dissertation is dedicated to

Luna Malika and Kira Ameera Gloria,

my life's absolute love, pride, and joy.

Acknowledgements

It certainly took a village to complete this work, and nothing of this dissertation would have been possible without the assistance, contribution, and support of the following individuals and organizations. I would like to sincerely thank:

Mary Steinhardt, my professor and supervisor, for believing in me and pushing me to pursue and accomplish what I never would have imagined to be within my abilities. You've opened so many doors and introduced me to so many opportunities that helped—and in some ways, forced—me to grow personally and professionally. Today, I am truly living the dream in Hawaii, and I could not be happier with my life and with my job, which all became possible because of everything you've done for me. Thank you.

My dissertation committee members—Alex Loukas, Carole Holahan, Tasha Beretvas, and Dave Drum. I will be forever grateful for all of your advice, insight, humor, and warmth. This dissertation process was quite a delight and was a beautiful culmination to my 12 years at UT Austin. I am so fortunate and I couldn't be happier to have each of you aboard my journey. Thank you for being such inspirations.

Liza Scarborough and the Office of the Vice President for Research for allowing us to work with you, for embracing our efforts, and especially for your initiative to improve the happiness and healthiness of the postdoctoral community.

Sara Champlin for providing the most thoughtful guidance and feedback during the development of the Qualtrics survey. The data collection process—arguably the most stressful time in any dissertation project—went by like a refreshing breeze thanks to you.

Stephen Hetzel for the many many countless times when you coerced me to join you at coffeeshops to work for many many countless hours on what seemed to be a never-ending-dissertation-nightmare. You and I both know that I truly could not have gone this far without you. You were there during my long and stressful internships as an undergrad; you were there during those scary late-night drives in sketchy neighborhoods when I was completing my thesis; you were there when it felt like I had to move a mountain when I relocated from Texas to Hawaii; and you are still here to help me see the conclusion of this 12 year journey from my baccalaureate to my doctorate. I owe you a lifetime of thanks.

The Department of Kinesiology and Health Education faculty and staff for all of your support—most especially the financial kind. As an impoverished grad student, each and every penny was strongly and positively correlated with the quality and success of my work. Thus, I would like express my gratitude for the George I. Sánchez Endowed Presidential Fellowship, Professor & Mrs. Karl K. Klein Endowed Graduate Scholarship, Ellis Graduate Scholarship, and the University Continuing Fellowship.

Finally, this project would have been completely null and void without the assistance and support of the university's postdoctoral research fellows and the SBS Postdoc Association. From the bottom of my heart, thank you so much for taking some time out of your very busy schedules to participate in my research. I hope that our findings will be helpful in the movement toward improving postdoctoral experiences and well-being.

The Multidimensional Influences of Positive Emotions on Stress, Coping, Resilience, Wellness, and Work Engagement

Publication No._____

Christian Tolentino Gloria, Ph.D.

The University of Texas at Austin, 2013

Supervisor: Mary A. Steinhardt

According to Fredrickson's broaden-and-build theory of positive emotions, positive emotions—such as joy, contentment, and love—help individuals cope with stress, maintain well-being, and flourish in life. Guided by this theory, this dissertation project conducted three studies which explored the multidimensional influences of positive emotions on stress, coping strategies, resilience, trait anxiety, depressive symptoms, and work engagement. Study 1 examined the mediating role of coping strategies on the link between positive emotions and resilience; in addition, the moderating effect of resilience on the influence of stress toward trait anxiety and depressive symptoms was tested. Study 2 investigated if one's positivity would distinguish differences in their levels of stress, trait anxiety, and depressive symptoms. Finally, Study 3 examined whether stress and positive emotions would account for the variance in work engagement, over and above what has been explained by known

predictors—specifically, work meaningfulness and supervisor support. Path analysis, interaction analysis, multivariate analysis of variance, and hierarchical multiple regression analysis were used to test the different models within these studies.

A sample of 200 postdoctoral fellows completed the survey (38% response rate). Results showed that a) coping strategies partially mediated the link between positive emotions and resilience; b) resilience moderated the effect of stress on trait anxiety and depressive symptoms; c) the different categories of positivity distinguished differences in experienced stress, trait anxiety, and depressive symptoms; d) stress and positive emotions accounted for additional variance in work engagement, above what is already explained by work meaningfulness and supervisor support; and e) positive emotions completely mediated the relationship between supervisor support and work engagement.

Findings support the broaden-and-build theory's hypotheses that positive emotions enhance adaptive coping strategies and fuel resilience. The data also demonstrated that resilience protected postdocs from experiencing heightened levels of trait anxiety and depressive symptoms by diminishing their relationships with stress. One strategy to optimize health would be to increase opportunities for postdocs to experience positive emotions, which would subsequently spark the upward spiral toward improved coping, greater resilience, and reduced stress, anxiety, and depression. To promote work engagement, it is important for supervisors to not only be mindful of assigning meaningful work to their employees (or help employees find meaning in their work), but supervisors should also be a supportive leader within a positive workplace environment.

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Chapter 1: Introduction

Previous research has revealed strong connections between stress and health, and ongoing studies continue to validate the growing evidence pointing that stress is a contributing factor to the development of many debilitating psychological problems such as anxiety disorders and depression (Insel & Roth, 2012; Nielsen, Kristensen, Schnohr, & Grønbæk, 2008). Depending on how individuals cope (i.e., using adaptive or maladaptive coping strategies), the harmful effects of stress can either be attenuated or exacerbated, leading to improved or worsened outcomes (Brown, Westbrook, & Challagalla, 2005; Meyer, 2001). Recent works in the field of positive psychology have demonstrated that emotions—particularly positive emotions such as love, gratitude, joy, and hope—play a critical role in fostering and optimizing individual well-being by promoting the use of adaptive coping strategies amidst adversity, and subsequently reducing or even reversing the deleterious effects of stress (Cohn & Fredrickson, 2009; Folkman, 2008; Fredrickson, 2000; Tugade, Fredrickson, & Feldman Barrett, 2004).

According to the broaden-and-build theory of positive emotions, positive emotions have the ability to broaden one's thought-action repertoire during times of stress (Fredrickson, 2001; Fredrickson & Branigan, 2005). In other words, the experience of positive emotions effectually expands one's cognizance of the many possible reactions, responses, and solutions that one can apply towards a present stressor. This widened perspective, in turn, allows individuals to identify, select, and utilize more effective stress management strategies, and thus enhances their likelihood to successfully

adapt against adversity. Furthermore, the broadened cognition and triumph against adversity consequently build one's arsenal of personal resources against future stressors (i.e., as the saying goes, "that which does not kill us makes us stronger"). In sum, the broadening and building effects of positive emotions aid in the management of stress and the development of individual resilience (i.e., one's ability to recover or bounce back from stressful events). Fredrickson and Losada have also discovered the positivity ratio criteria which have the ability to predict individual quality of life as well as organizational success; according to their work, as calculated by the ratio of experienced positive-to-negative emotions, those who reported a ratio of <1.0 were considered *depressed*, 1.0 to 2.9 were *languishing*, and >2.9 were *flourishing* (2005).

Additionally, studies guided by this theory have demonstrated that positive emotions not only have the power to enhance human strengths, but also have the capability to reverse the lingering aftereffects of stress (Fredrickson, Mancuso, Branigan, & Tugade, 2000; Gloria, Faulk, & Steinhardt, 2012). Furthermore, emerging research in positive psychology has exhibited alternative effects showing that the beneficial properties of positive emotions are not only limited to directly bolstering personal resources and resilience, or directly attenuating the aftermath of stress; recent evidence suggests that positive emotions also protect individuals against stress by interacting with or moderating the harmful effects of stress on health (Faulk, Gloria, Steinhardt, & Cance, 2012; Ong, Bergeman, Bisconti, & Wallace, 2006).

The beneficial effects of positive emotions also apply to larger levels beyond that of the individual. There is increasing interest in research to better understand the

implications of positive emotions toward groups of individuals or organizations. Particularly in the work environment, studies have shown that positive emotions can promote individual and organizational satisfaction, productivity, and well-being (Avey, Wernsing, & Luthans, 2008; Fredrickson, 2003; Wright, Cropanzano, & Bonett, 2007). Researchers have been especially interested in examining employee work engagement because of its substantial contribution toward organizational success (Schaufeli, Bakker, & Salanova, 2006; Simpson, 2009). Previous studies found that the strongest contributors to work engagement were work meaningfulness and supervisor support (Kahn, 1990; May, Gilson, & Harter, 2004; Saks, 2006); however, no studies to date were found to have examined and compared the contributions of stress and positive emotions on work engagement, relative to the effects of work meaningfulness and supervisor relations. Considering that stress and positive emotions have been correlated with the burnout syndrome (Gloria et al., 2012), and burnout is viewed as the antipode of engagement (Schaufeli et al., 2006), stress and positive emotions are expected to be related to work engagement.

Of particular interest to this dissertation project is the population of postdoctoral research fellows (postdocs). Postdocs, ironically, are an overlooked and understudied population. Reports indicated that postdocs are constantly exposed to high levels of chronic stress (Smaglik, 2006; Small, 2012). Often characterized as neither a faculty nor a student, postdocs tend to fall in the cracks and consequently receive neither the recognition nor the benefits that they feel is deserved (Aschwanden, 2006; Smaglik, 2006). They often express feelings of fear, uncertainty, pressure, and lack of security due

to the impermanence of their employment, high work expectations, as well as the extreme competitiveness of the job market (Davis, 2009; Kaplan, 2012; Woolston, 2002). Considering these points, is it not surprising that postdocs describe their work and life as extremely stressful, and often filled with feelings of anxiety and depression.

PURPOSE AND HYPOTHESES

Guided by the broaden-and-build theory of positive emotions, this dissertation project conducted three studies to explore and examine the multidimensional effects of positive emotions on stress, coping strategies, resilience, trait anxiety, depressive symptoms, and work engagement, using a sample of postdocs from a large research institution.

Study I: Positive Emotions Enhance Coping, Fuel Resilience, and Protect Individuals Against the Harmful Effects of Stress: Implications of the Broaden-and-Build Theory

The purpose of the present study was to examine if (a) positive emotions fueled resilience; (b) coping strategies mediated the link between positive emotions and resilience; and (c) resilience moderated the influence of stress on trait anxiety and depressive symptoms (i.e., as levels of stress increase, individuals with higher scores of resilience will report lower levels of trait anxiety or depressive symptoms as compared to those with lower resilience).

In the mediation analysis, it was hypothesized that (a) positive emotions would have a positive direct effect on adaptive coping strategies, (b) positive emotions would

have a negative direct effect on maladaptive coping strategies, (c) positive emotions would have a positive direct effect on resilience, (d) adaptive coping strategies would have a positive direct effect on resilience, (e) maladaptive coping strategies would have a negative direct effect on resilience, and (f) adaptive and maladaptive coping strategies would mediate the relationship between positive emotions and resilience. It was also hypothesized that (g) the indirect effect through adaptive coping strategies would be stronger than through maladaptive coping strategies.

As for the moderation analysis, it was hypothesized that (a) stress would have a positive direct effect on trait anxiety and depressive symptoms, (b) resilience would have a negative direct effect on trait anxiety and depressive symptoms, and (c) resilience would interact with stress in such a manner that resilience would moderate the effect of stress on trait anxiety and depressive symptoms.

Study II: Flourishing, Languishing, and Depressed Postdoctoral Fellows: Differences in Stress, Trait Anxiety, and Depressive Symptoms

Based on the positivity ratio criteria, the purpose of the present study was to examine if groups of flourishing, languishing, and depressed postdocs would significantly differ from each other in scores of stress, trait anxiety, and depressive symptoms. It was hypothesized that (a) flourishing individuals would report the lowest levels of stress, trait anxiety, and depressive symptoms; (b) depressed individuals would report the highest levels of stress, trait anxiety, and depressive symptoms; and (c) languishing individuals would report scores in between the flourishing and depressed groups.

Study III: Determinants of Work Engagement among Postdoctoral Fellows: The Impacts of Work Meaningfulness, Supervisor Support, Stress, and Positive Emotions

The purpose of the present study was to (a) investigate if stress and positive emotions would significantly account for variance in work engagement, over and above what has been explained by known predictors (viz., work meaningfulness and supervisor support) as well as a variety of demographic covariates; (b) examine how much variance in work engagement can be explained altogether by work meaningfulness, supervisor support, stress, and positive emotions; (c) determine how much unique variance is explained by each independent variable; and (d) compare the strengths of the independent variables and identify the strongest determinants of work engagement among postdocs. It was hypothesized that (a) stress would have a negative association with work engagement, (b) positive emotions would have a positive effect on work engagement, (c) work meaningfulness would have a positive effect on work engagement, and (d) supervisor support would have a positive effect on work engagement.

SIGNIFICANCE

Results from this study will serve to either confirm or disconfirm the utility of the broaden-and-build theory of positive emotions toward a novel population that is highly stressed, underserved, and often overlooked in research. This research will explore if positive emotions—as demonstrated in previous research using other populations—can promote personal resilience and protect postdocs from experiencing harmful levels of

anxiety and depression. Further, this study will provide insight regarding how employers can enhance work engagement among postdocs by identifying the potential factors that fuel employee engagement at the workplace.

DELIMITATIONS

The present study used cross-sectional and self-report data from a sample of postdocs representing a variety of demographic profiles. The participants were recruited from a pool of postdocs who were employed at a large research university in the state of Texas during the spring of 2012. There were no exclusion criteria; thus, all postdoctoral fellows across the university—from all colleges and departments—were allowed to participate regardless of age, gender, marital status, race/ethnicity, or country of origin. However, due to this localized participant sampling, results and implications may not be generalizable to postdocs from other institutions or locations as well as those from other time periods.

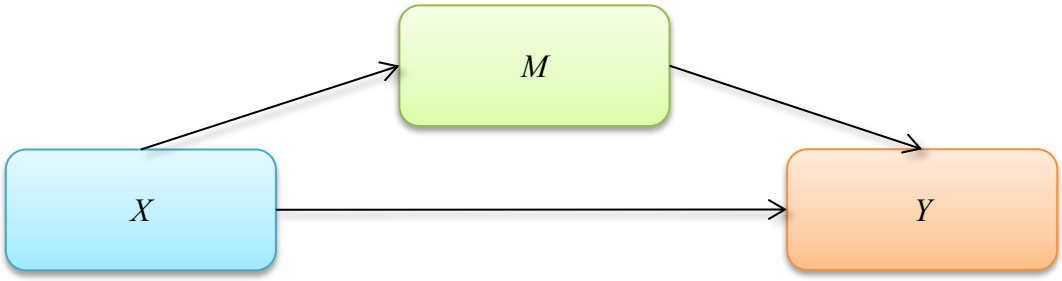
DEFINITION OF TERMS

Mediating Effect

This suggests that the effect of an independent variable on a dependent variable is accounted for—partially or completely—by another variable. For instance, the effect of stress on depression may be mediated by burnout, in such a way that depression is predicted by burnout, and burnout is predicted by stress (i.e., stress→burnout→

depression). This effect is determined by examining the direct and indirect effects among the three variables.

Figure 1. Conceptual model of *M* acting as a mediating variable in the relationship between *X* and *Y* (Earp & Ennett, 1991; Masten, Cutuli, Herbers, & Reed, 2009; Preacher & Hayes, 2004, 2008)

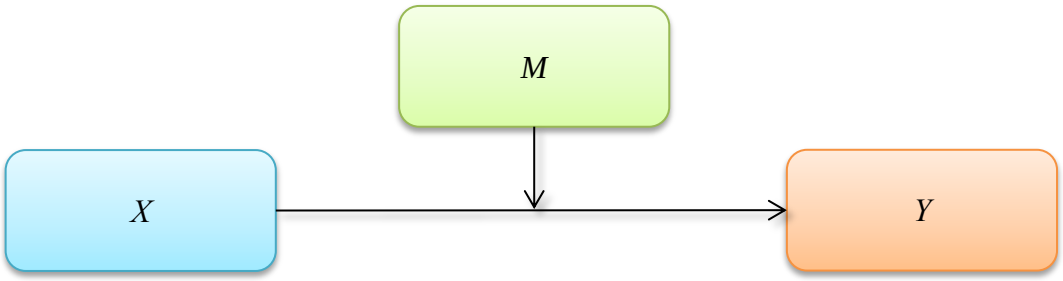


Note: This illustrates that *X* exerts an indirect effect on *Y* through *M*.

Moderating Effect

(Also referred to as modifying, buffering, or protective effect.) This effect is indicative of a statistical interaction between two variables, such that the magnitude of the effect of an independent variable on a dependent variable is influenced by another independent variable. For example, if the impact of stress on health decreases as individual positivity increases, or vice versa, this suggests that positivity has a moderating effect on the relationship between stress and health. A moderating effect is tested by regressing the dependent variable on the interaction term of the two independent variables.

Figure 2. Conceptual model of *M* acting as a moderating variable in the relationship between *X* and *Y* (Earp & Ennett, 1991; Fergus & Zimmerman, 2005; Frazier, Tix, & Barron, 2004; Masten et al., 2009)



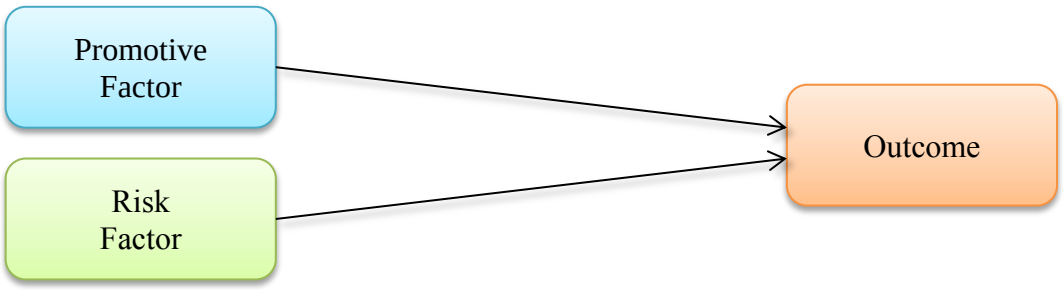
Note: This illustrates that the presence of *M* either magnifies or weakens the relationship between *X* and *Y*.

Promotive Effect

This effect represents a direct relationship (or a main effect) between a beneficial factor and an outcome variable, and promotive effects oppose the influence of risk factors on the outcome. For example, stress may have a direct positive relationship with depression (i.e., higher stress is linked with higher depression), in contrast to social support which may have a direct negative relationship with depression (i.e., higher social support is related to lower depression). Such beneficial factors that oppose the effects of risk factors and thus lead to improved outcomes are referred to as assets (Masten et al., 2009), compensatory factors (Fergus & Zimmerman, 2005), resources (Conrad & Hammen, 1993), or promotive factors (Luszczynska & Cieslak, 2005). Because the effects of promotive factors may alleviate the deleterious influences of risk factors—described by some as an antidote-like effect (Fredrickson et al., 2000)—the term "promotive effect" is also synonymous to what other researchers refer to as the "additive

effect" (Masten et al., 2009), "compensatory effect" (Fergus & Zimmerman, 2005), or "undoing effect" (Fredrickson et al., 2000).

Figure 3. Conceptual model of the direct effects of promotive and risk factors on the outcome variable (Fergus & Zimmerman, 2005; Masten et al., 2009)



Protective Effect

See definition for *Moderating Effect*. A protective effect occurs when a beneficial factor weakens the relationship between a risk factor and an outcome (Fergus & Zimmerman, 2005; Masten et al., 2009).

Chapter 2: Literature Review

STRESS

Whether physically experienced or psychologically perceived, stress is an inevitable and unavoidable aspect of life. In some cases, stress may be considered as a positive essence of life which enables individuals to feel more excited about new challenges or more energized to effectively deal with adversity. However, stress can also be appraised as harmful and threatening to one's health and well-being (Chrousos, 2009; Newbury-Birch & Kamali, 2001). Growing research in the study of stress is raising concerns as it becomes more evident that stress can have serious deleterious effects on health and on multiple dimensions of wellness: psychological, emotional, social, and physical (Insel & Roth, 2012; Murphy & Archer Jr., 1996).

Stress is experienced when certain events are appraised as taxing to one's available resources and when undesirable situations seemingly overwhelm an individual's ability to cope (Lazarus & Folkman, 1984); other researchers described that stress occurs when one's sense of balance or homeostasis is disrupted or compromised (Carver, 1998; Chrousos, 2009; Connor & Davidson, 2003; O'Leary & Ickovics, 1995). These thought processes and feelings of threat to well-being, in turn, result in the activation of the psychophysiological reaction to stress that is commonly referred to as the fight-or-flight response (Folkman, 2008; Garland et al., 2010; Howard, 2006). This response is characterized by heightened levels of cardiovascular and neuroendocrine reaction—such as increased heart rate, blood pressure, respiration, and cortisol—which

optimizes one's energy potential and aids in the fight against adversity or flight from harm (von Dawans, Fischbacher, Kirschbaum, Fehr, & Heinrichs, 2012).

In the short-term, these responses can be beneficial toward acute and transient stressors (Fredrickson, 2009a). However, if these psychophysiological reactions are triggered frequently or continue over a long period of time, this heightened and enduring state of stress beyond homeostasis can dramatically increase one's risks for a number of health problems including cardiovascular disease (Gun Kang et al., 2005; Iso et al., 2002; Jood, Redfors, Rosengren, Blomstrand, & Jern, 2009; Kivimaki et al., 2002; Kok, Catalino, & Fredrickson, 2008), obesity (Dallman et al., 2003; de Luca & Olefsky, 2006), diabetes (Lloyd, Smith, & Weinger, 2005; Wellen, Hotamisligil, xF, & khan, 2005), immune disease (Kemeny & Schedlowski, 2007), burnout (Lloyd, King, & Chenoweth, 2002; Steinhardt, Smith Jaggars, Faulk, & Gloria, 2011), anxiety (Kleppa, Sanne, & Tell, 2008; Melchior et al., 2007), and depression (Markou & Cryan, 2012; Nielsen et al., 2008; Steinhardt et al., 2011).

Additionally, stress was found to have strong negative correlations with happiness and life satisfaction (Schiffrin & Nelson, 2010). Psychological stress affects not only satisfaction with life, but it was also documented to have a strong impact on one's job satisfaction (Newbury-Birch & Kamali, 2001) as well as on students' academic performance (Murphy & Archer Jr., 1996). The damaging effects of stress also goes beyond the individual, and can substantially harm interpersonal relationships and marital cohesion (Robinson, Flowers, & Carroll, 2001). In a study involving military personnel, the data revealed that stress was a strong predictor of substance use, especially among

men (Bray, Fairbank, & Marsden, 1999). Lastly, a 22-year prospective cohort study found that perceived psychological stress was associated with total and cause-specific mortality; results of the study revealed that higher levels of stress were related to higher all-cause mortality, doubled the risk of death from respiratory diseases, threefold higher mortality due to external causes (e.g., accidents, assault), and six times greater risk of death from committing suicide (Nielsen et al., 2008).

In addition, researchers revealed a strong positive correlation between stress and anxiety, such that higher levels of stress were related to higher levels of anxiety (Newbury-Birch & Kamali, 2001). In support of this notion, another study showed that work stress contributed to the development of anxiety and depression (Melchior et al., 2007).

ANXIETY

Anxiety is conceptualized in two ways: state anxiety and trait anxiety (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). State anxiety is described as an unpleasant emotional state or condition, such as feeling nervous or worried about a particular stimulus (e.g., upcoming public speaking task). It is often transitory, which comes and goes with the stressors, but can span over longer periods of time if the triggering conditions persist. On the other hand, trait anxiety refers to stable individual differences between people with regard to their tendency to perceive and appraise stressors as threatening or dangerous (Van Dam, Gros, Earleywine, & Antony, 2011). Trait anxiety is an individual's disposition to respond to stressful situations with varying

degrees of state anxiety. Those with higher levels of trait anxiety are more likely to respond to stressful situations with higher intensities of state anxiety reactions (e.g., feelings of tension, apprehension, and nervousness). Regardless of the actual danger of the stressful circumstance, the individual's perception of threat may have a greater influence on the experienced anxiety state (Spielberger, Gorsuch, Jacobs, Lushene, & Vagg, 1968, 1977; Spielberger et al., 1983).

It is estimated that approximately 40 million American adults are affected by anxiety disorders each year (Kessler, Chiu, Demler, & Walters, 2005). Anxiety disorders include obsessive-compulsive disorder, phobias, generalized anxiety disorder, post-traumatic stress disorder, and panic disorder (National Institute of Mental Health, 2013). Total healthcare costs related to anxiety disorders were estimated to be over $42 billion per year (Greenberg et al., 1999). Anxiety, like stress, can significantly contribute to the development of many health problems, disability, morbidity, and mortality (Balon, 2006). For instance, researchers found strong correlations between anxiety and asthma (Thoren & Petermann, 2000), cardiac disorders, hypertension, gastrointestinal problems, and genitourinary disorders (Härter, Conway, & Merikangas, 2003). Also, individuals with high levels of anxiety and stress were found to suffer from migraine attacks more frequently and for longer periods of time (Wacogne, Lacoste, Guillibert, Hugues, & Le Jeunne, 2003). Studies revealed strong associations between stress and anxiety, and their results indicated that those who experienced higher stress and anxiety reported substantially lower satisfaction at work (Newbury-Birch & Kamali, 2001) and had greater

susceptibility to physical and psychological illnesses (Rawson, Bloomer, & Kendall, 1994).

A consistent pattern in multiple studies is the comorbidity of anxiety and depression. Researchers consistently find that individuals who are suffering from anxiety are also likely to be affected by depressive symptoms (Barbee, 1998; Hale III, Raaijmakers, Muris, Van Hoof, & Meeus, 2009; Kleppa et al., 2008; Webinar, Roundtable, & Part, 2005; Wheatley, 1997).

DEPRESSIVE SYMPTOMS

Studies have shown that stress and anxiety are among the strongest factors behind the precipitation of depressive symptoms (Van Praag, 2005; Wheatley, 1997). When someone is exposed to long durations of stress, depression may develop unnoticed under the guise of anxiety symptoms. Furthermore, those who suffer from depression tend to also have a diminished ability to cope with stress, and hence a vicious cycle ensues involving the reciprocal aggravation of stress, anxiety, and depression (Wheatley, 1997). Depression can be a debilitating psychological disorder that can severely impair both mental as well as physical functioning (Paschalides et al., 2004).

According to the Centers for Disease Control and Prevention (CDC), nearly 10% of US Americans suffer from depression (2010). It is estimated that approximately 1 in 5 Americans have experienced some type of mental illness, and depression was reported to be the most prevalent mental health problem among adults 55 years or older (CDC, 2011). In terms of financial burden, national healthcare costs related to mental health

services exceeded $100 million in 2003 (National Center for Health Statistics, 2007); and according to a study, depressed patients had higher healthcare expenses and paid nearly twice as much as individuals who were not depressed (Simon, VonKorff, & Barlow, 1995). Those who experience chronic levels of depressive symptoms have greater risk of developing sleeping disorders (Wheatley, 1993), and other chronic ailments such as arthritis, asthma, cardiovascular disease, cancer, diabetes, and obesity (CDC, 2010). Depression has also been linked with increased work absenteeism, disability, and diminished productivity (Stewart, Ricci, Chee, Hahn, & Morganstein, 2003). In addition, depression was found to be as harmful to health as smoking tobacco (Mykletun et al., 2009), and the risk of mortality from unnatural causes is especially higher for those experiencing major depression (Harris & Barraclough, 1998). A meta-analysis also revealed that depressed individuals were over three times less likely to comply with prescriptions and medical treatment (DiMatteo, Lepper, & Croghan, 2000).

COPING: ADAPTIVE AND MALADAPTIVE

How individuals deal with stress can be the determining factor between a good or a bad outcome. Maladaptive coping strategies can exacerbate stress, anxiety, and depression; however, adaptive coping strategies effectively deal with the stressor and thus prevent the development of anxiety disorders and depression (Brown et al., 2005). Adaptive coping strategies are stress management techniques that are generally effective in improving the stress-coping adaptational outcome (Lazarus, 1993), and these strategies include six dimensions: active coping, planning, positive reframing, acceptance,

emotional support, and instrumental support (Carver, 1997). Active coping refers to one's engagement toward dealing with the present stressor; planning is characterized by an individual's attempt to prepare the steps necessary to successfully manage stress; positive reframing describes someone's ability to find good meanings even under bad situations; acceptance refers to an individual's ability to receive and embrace the reality of any given situation; emotional support is defined as the degree of psychosocial support that one can call upon during times of stress; and instrumental support is characterized by the resources one can use toward the management of stress.

In contrast, self-distraction, denial, venting, substance use, behavioral disengagement, and self-blame are the dimensions of maladaptive strategies that generally lead to ineffective stress management which results in unchanged or poorer outcomes (Brown et al., 2005; Carver, 1997). Self-distraction refers to someone's tendency to avoid confrontation with the stressor; denial can be understood as the opposite of acceptance, and allowing oneself to believe that the stressor does not exist; venting refers to inappropriate expressions of negative feelings to others; substance use is defined as an individual's intake of psychoactive drugs or alcohol; behavioral disengagement is characterized by someone's inactivity and lack of desire to tackle the stressor; and self-blame refers to the inappropriate and self-destructive criticism of oneself.

Differences in how individuals use coping strategies have been associated with overall health and well-being (Lazarus & Folkman, 1984). Coping behavior has been shown to moderate the effects of stress, such that individuals with greater coping

resources—or who use more adaptive coping strategies—recorded having weaker associations between stress and illness, as compared to those with poorer coping resources (Eriksen, Olff, Murison, & Ursin, 1999; Rawson et al., 1994). Researchers continue to find that those who use adaptive coping had greater physical and mental health (Duangdao & Roesch, 2008; Moskowitz, Hult, Bussolari, & Acree, 2009), whereas greater utility of maladaptive strategies has been associated with undesirable consequences such as exacerbated stress, anxiety, depression, and reduced physical health (Roesch et al., 2005; Zeidner & Saklofske, 1996).

THE BROADEN-AND-BUILD THEORY OF POSITIVE EMOTIONS

Broadening and Building Effects

Evidence suggests that coping strategies may be associated with emotionality. Researchers found that maladaptive coping strategies (e.g., venting) were related to the individual's negative emotions (Brown et al., 2005); on the other hand, adaptive coping strategies (e.g., positive reframing) were associated with positive emotions (Fredrickson & Joiner, 2002). Fredrickson's broaden-and-build theory of positive emotions suggests that positive emotions broaden an individual's mindset and worldview, which consequently promotes their desire to approach novel experiences and engage with new opportunities (Fredrickson, 2005). These series of positive events then foster the building of the individual's personal resources, such as adaptive coping strategies, which bolsters one's abilities to face adversity, grow, and thrive (see Figure 4). As Fredrickson (2004) described it best,

> "Positive emotions broaden an individual's momentary thought-action repertoire: joy sparks the urge to play, interest sparks the urge to explore, contentment sparks the urge to savour and integrate, and love sparks a recurring cycle of each of these urges within safe, close relationships… by broadening an individual's momentary thought-action repertoire—whether through play, exploration or similar activities—positive emotions promote discovery of novel and creative actions, ideas and social bonds, which in turn build that individual's personal resources; ranging from physical and intellectual resources, to social and psychological resources… that can be drawn on later to improve the odds of successful coping and survival" (p. 1367).

This theory can be viewed as the antithesis to the "fight or flight" response which, in contrast, focuses an individual's mindset and thought-pattern in order to allow them to make hasty decisions to either attack or avoid adversity. This evolutionary inheritance can be important particularly during stressful situations that mandate immediate action (i.e., when the individual does not have time to brainstorm options but instead needs to quickly and decisively deal with stressful situations to ensure immediate success or survival). With that said, while the fight-of-flight response served a critical purpose in history, it may not be as useful in the present times, and growing evidence suggests that this psycho-physiological response can be detrimental to health, especially among individuals who suffer from chronic stress (Curtis & O'Keefe, 2002). Fredrickson and Branigan explained that the narrowed thought-action repertoires from negative emotions may be adaptive and beneficial during specific short-term stressors, but the wider

thought-action repertoire from positive emotions would be more adaptive and beneficial over the long-term (2005).

Positive emotions, according to Fredrickson, not only indicate health and well-being but they also promote continued wellness. She further describes that the produced optimal functioning is not only available at the present moment of experience, but that the beneficial outcomes reaped from experiencing positive emotions also provide long-term benefits (Fredrickson, 1998, 2001). Even during stressful situations when the mind and body may automatically evoke the narrowing of the mindset, she argues that individuals with broadened thought-action repertoires are already better equipped to effectively tackle the stressor because such individuals with broadened mindsets have built reserves of personal resources (Fredrickson, 2004).

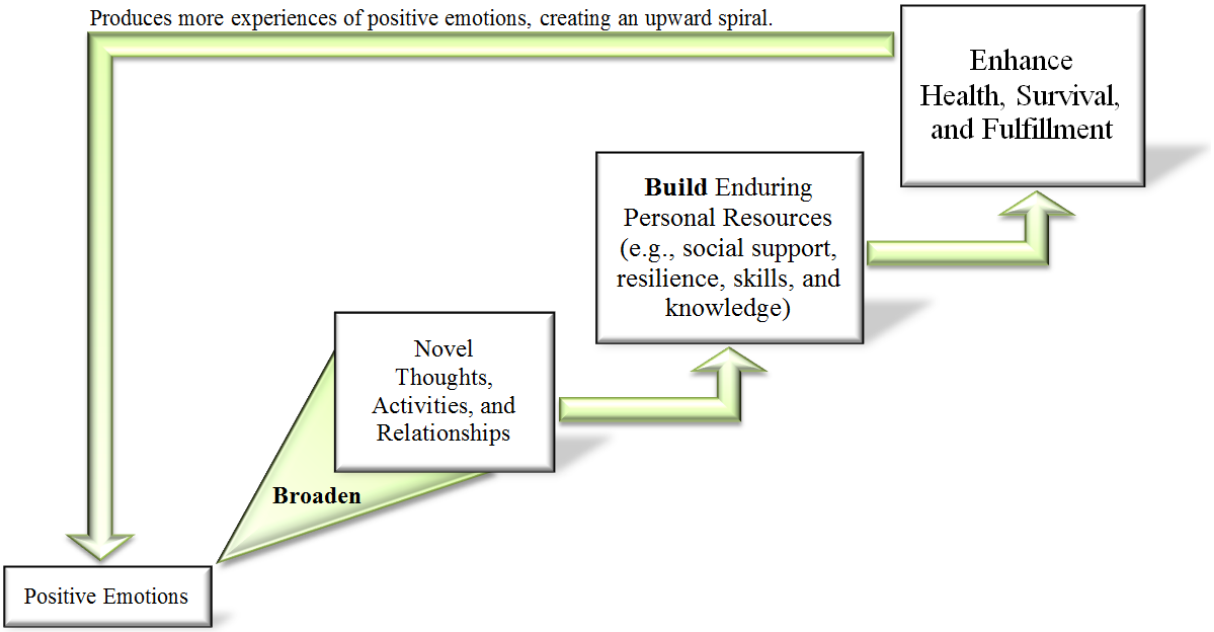
When individuals experience positive emotions, they are more likely to engage in "playful" activities that build physical resources which also foster inter-personal interactions and bonds that build social resources; playing also promotes creative thinking and nourishes brain development that builds knowledge and intellect. The accompanying feelings of enjoyment from these pleasant experiences further prompt positive feelings such as happiness, contentment, and love, which further enable continued health-promoting behavior. Moreover, the personal resources built from these experiences remain beyond the moment of the positive-emotion inducing experience; this built resource can be used at another time even during difficult or negative emotional states—perhaps to positively turn negative emotions (Brown & Vaughan, 2009; Fredrickson, 2000, 2004). For instance, after individuals gain social support from having

positive interactions with peers, they can then summon this newfound support network to provide assistance during trying times, and thus increase their likelihood to overcome the adversity. The broaden-and-build theory of positive emotions, in summary, posits that having positive emotions can trigger a sort of "ripple effect" which starts with the fueling of one's desire to approach and engage in novel experiences—physically, emotionally, socially, mentally—resulting into personal as well as interpersonal growth, and ultimately strengthening one's personal arsenal to effectively cope, grow, and thrive (Tugade & Fredrickson, 2004).

Recently, researchers tested the build hypothesis by having individuals practice loving-kindness meditation exercises, and they found that participants reported continued increases in experiences of positive emotions over time between pre- and post-intervention. Moreover, they also reported increases in a variety of personal resources such as mindfulness, sense of purpose, and social support, as well as decreases in illness symptoms. Consequently, the accumulation of personal resources was accompanied by increased levels of life satisfaction and decreased reports in depressive symptoms (Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008). The authors conceptualized that the loving-kindness meditation directly predicted the increase in positive emotions, which then directly predicted the increase in personal resources, which ultimately directly predicted the increase in life satisfaction. Resilience research among college students before and after the September 11, 2001 terrorist attack adds support in the mediating properties of positive emotions, when researchers found that positive emotions mediated

the relationship between personal resilience factors and subsequent depression or growth (Fredrickson, Tugade, Waugh, & Larkin, 2003).

Figure 4. Conceptual model of the broaden-and-build theory of positive emotions (Cohn & Fredrickson, 2009)

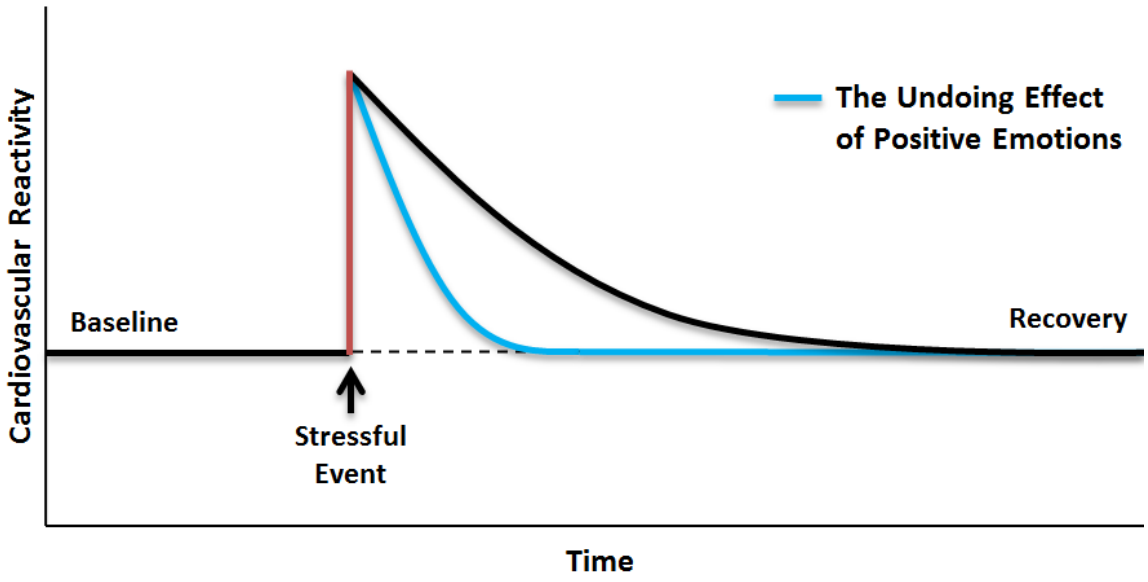


Undoing Effect

In addition to the broadening and building effects of positive emotions, recent studies have also found that positive emotions may have the ability to also undo the aftereffects of negative emotions, as suggested by the evidence of positive emotion's direct effect on health and well-being. To test this hypothesis, participants were first exposed to fear-eliciting films in order to induce a negative response which was measured by cardiovascular activity as well as self-rated responses on the intensity of positive/negative emotions during the viewing of the film. Afterwards, the participants

were then exposed to positive, neutral, or negative films, and similar measures were recorded to examine which of the participants would most quickly recover to baseline cardiovascular activity as measured prior to exposure to the fear-eliciting film. ANOVA results found that those who watched the positive film more quickly returned to baseline cardiovascular activity than the neutral or negative group (see Figure 5) (Fredrickson & Levenson, 1998).

Figure 5. Conceptual model of the undoing effect of positive emotions (see Figure 3 for an alternate model representation)

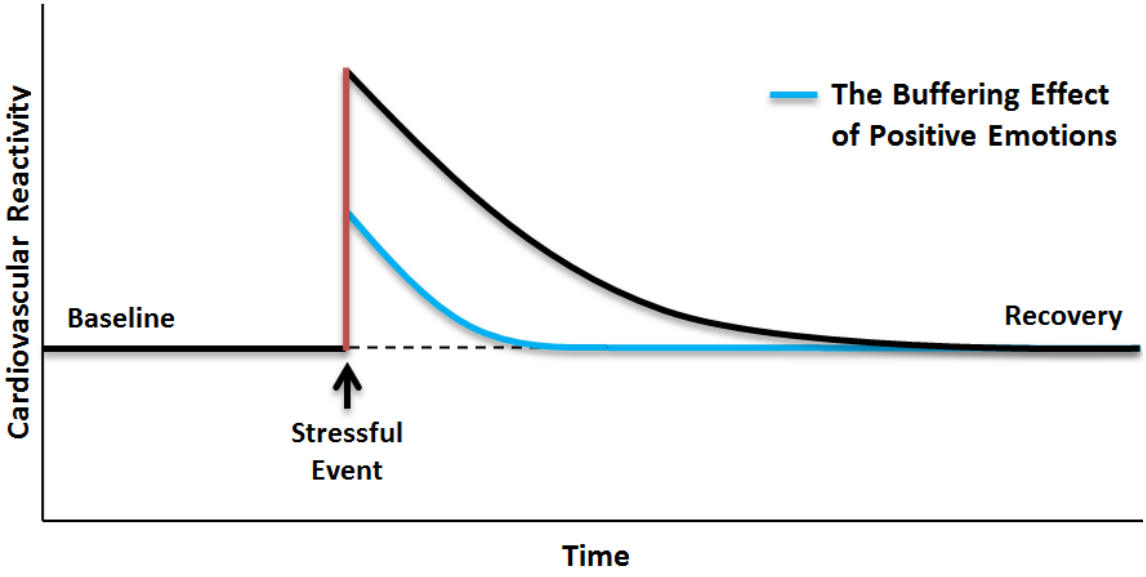


Buffering Effect

A novel concept that is recently emerging from the literature is the moderating or buffering effect of positive emotions on the relationship between stress and health. For example, researchers found that positive emotions diminished the influence of stress on depressive symptoms in a sample of military spouses. In other words, depressive

symptoms increased with the rise in levels of stress, but spouses with higher levels of positive emotions exhibited fewer depressive symptoms than those with lower positive emotions (Faulk, Gloria, Steinhardt, et al., 2012). In addition, another study found that daily exposure to positive emotions moderated the effect of stress on future negative affectivity; as stress increased, future negative affectivity was also expected to increase, but individuals with higher levels of positive emotions reported a reduced slope as compared to those with lower levels of positive emotions (Ong et al., 2006). Therefore, these studies suggest that positive emotions not only directly influence health and illness, but they may also interact with other factors to either strengthen or weaken their actual effects (see Figure 6).

Figure 6. Conceptual model of the buffering effect of positive emotions (see Figure 2 for an alternate model representation)



Positivity Ratio

Just like how water turns to ice at 0º Celsius, researchers have found such a tipping point with respect to a person's well-being. Experiencing positive emotions at a ratio greater than 2.9 with negative emotions is believed to be the tipping point between human languishing and flourishing (Fredrickson & Losada, 2005). According to research, individuals who report having positivity ratios greater than 2.9 demonstrate greater resilience to adversity, are more successful at work, and *flourish* in life; those with a ratio from 1.0 to 2.9 are considered *languishing*, and characterized by individuals who feel "stuck in a rut" and stagnate in life; lastly, those with a ratio below 1.0 are classified as *depressed*, and are described as those with a diminished quality of life and likely to be clinically depressed (Fredrickson, 2009a; Schwartz et al., 2002).

The positivity ratio has been associated with well-being (Diener, 2000; Kahneman, Diener, & Schwarz, 1999), such that higher positivity ratios represent greater human flourishing, characterized by resilience and growth (Fredrickson & Losada, 2005). For example, positivity demonstrated a direct effect on improved psychological functioning (Nelson & Knight, 2010), effectiveness of novice teachers placed in under-resourced public schools (Duckworth, Quinn, & Seligman, 2009), adaptive coping among military spouses and public school teachers (Faulk, Gloria, & Steinhardt, 2012), and physiological health (Fredrickson & Levenson, 1998).

RESILIENCE

Since the introduction of resilience research in the last few decades, the rapid growth in the field produced a variety of definitions and measures which resulted in disagreements among researchers as well as confusion and misuse of the term "resilience" (Kaplan, 1999; Kaufman, Cook, Arny, Jones, & Pittinsky, 2008; Luthar, Cicchetti, & Becker, 2000; Ungar, 2004). In earlier research, individuals who emerged positively from negative experiences were labeled as "invulnerable" (Anthony & Cohler, 1987; Seifer & Sameroff, 1987). However, others have considered the concept of invulnerability to be potentially misleading due to its implication that an invulnerable person is unaffected by—or remains immune to—adversity (Luthar et al., 2000; Ungar, 2004). Recent studies suggest, in contrast, that those who emerge positively from adversity are actually affected by the impact of stress, and that their ability or inability to cope with stressors was relative, contextual, and impermanent; for instance, at the onset of the stressor, individuals who ultimately adapt to stressful experiences reported reductions in well-being before recovering back to baseline or, in other cases, growing to even higher levels of well-being (Fergus & Zimmerman, 2005). In addition, it was also found that resilience is a dynamic process that changes over time (McGloin & Widom, 2001). Due to the controversy and limited evidence that support the implications of invulnerability, researchers began to instead use the term "resilience," which better portrayed the relative characteristics of the concept (Luthar et al., 2000).

Similar to "invulnerability," the concept of "resilience" is also controversial. In broader terms, there is a general consensus among researchers in defining resilience as an

individual's adaptation from stressful experiences in which desirable outcomes are achieved, particularly when undesirable outcomes are expected (Fergus & Zimmerman, 2005; Kaplan, 1999; Masten, 2001; Prince-Embury & Courville, 2008; Rutter, 2006). However, depending on the field and scope of research, how resilience is further defined and operationalized vary widely, which consequently adds to the complexity and disarray of how resilience-related constructs (i.e., risk factors, resource factors, protective factors, and outcomes) are defined (Kaplan, 1999; Ungar, 2004).

In literature, the terms "resilience" and "resiliency" have been interchangeably used as though they were similar (Benard, 1991; Kaufman et al., 2008; Rauh, 1989); however, many argue that they are not. According to a number of authors, "resilience" represents the dynamic developmental process explicating one's interactions with self and the environment in order to achieve or maintain desirable outcomes in the face of adversity. In contrast, "resiliency" refers to stable individual characteristics or personality traits (e.g., resourcefulness, hardiness, optimism) which could also play a part in the process of resilience in promoting positive outcomes (Luthar et al., 2000; Masten, 1994).

Another disagreement among researchers is whether resilience is defined as the outcome or the factor(s) influencing the outcome. Kaplan (1999) discussed that the determinant of resilience—as either the outcome or the influence of the outcome—depends on the researcher's question of interest. For instance, he explained how some scope of research focuses on the maintenance of adaptive functioning during stressful situations, thus indicating the researcher's conceptualization of resilience as an outcome;

but in contrast, researchers may instead examine constructs that influence the relationship between risk and outcome, such as the personal characteristic "hardiness" which was shown to have a moderating effect on the impact of stress on well-being (Hystad, Eid, Laberg, & Johnsen, 2009). Whether resilience is operationalized as an outcome or cause of the outcome, there continues to be variations in how the concept is further defined, which is also determined by the scope and question of research. Scientists have examined resilience from a number of perspectives including academic, social, emotional, psychological, physiological, and behavioral domains. Criteria for the concept of resilience (e.g., categorizing desirable from undesirable outcomes) have also been questioned and vary depending on the research methodology. Examples of desirable outcomes include individuals who relatively fare better than their counterpart, function greater than expected, recover from traumatic events, or show growth from stressful experiences (Condly, 2006; Kaplan, 1999). Some measures of resilience have received criticisms regarding the subjectivity of their criteria, such that the determination of desirable versus undesirable outcomes was guided by socio-cultural norms and expectations (Ungar, 2008; Ungar et al., 2008); therefore, sensitivity to cultural differences (e.g., age, gender, family dynamic, race/ethnicity, socioeconomic status) must be carefully considered before generalizing findings from one population to another.

For the purposes of this dissertation project, resilience was defined simply as "one's ability to bounce back or recover from stress" (Smith et al., 2008). Resilience and one's ability to effectively return to homeostasis, especially if stress is recurrent, can determine subsequent wellness or illness. As discussed earlier, positive emotions have

been shown to build resilience through a variety of means including the promotion of adaptive coping strategies (Folkman & Moskowitz, 2000; Tugade & Fredrickson, 2007). Studies have also suggested that resilience has the ability to moderate the relationship between stress and depression (Pinquart, 2009; Wingo et al., 2010). However, the recently developed Brief Resilience Scale (BRS; Smith et al., 2008) has not been thoroughly tested in the aforementioned contexts, and therefore this instrument and construct will be examined in the present study.

WORK ENGAGEMENT

Interest in understanding the determinants of employee work engagement has been growing as employers realize its strong relationship with employee productivity and the greater organizational success (Freeney & Tiernan, 2006; Kahn, 1990; Simpson, 2009). Researchers propose that work engagement is characterized by three dimensions; they are vigor, dedication, and absorption. Vigor is described as the individual's level of energy toward work, and their willingness to invest time and effort in their work despite challenging conditions; dedication is characterized by the individual's degree of involvement, ownership, and pride over their work; and lastly, absorption refers to the extent of how engrossed an employee feels about their work, to the point where time seems to flow more quickly than expected (Bakker & Demerouti, 2008; Bakker, Schaufeli, Leiter, & Taris, 2008; Schaufeli et al., 2006). Others have defined work engagement as that which can be defined as a positive affective-motivational state of fulfillment in employees (Freeney & Tiernan, 2006). Employees who are more engaged

at work are also likely to be less stressed, more satisfied with their jobs, are more productive members of their organization, and are healthier overall (Saks, 2006; Schaufeli et al., 2006).

Researchers consider work engagement to be the antipode of the burnout syndrome, which is characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment (González-Romá, Schaufeli, Bakker, & Lloret, 2006; Schaufeli et al., 2006; Schaufeli, Leiter, & Maslach, 2009). Emotional exhaustion is characterized by feelings of fatigue or being drained of emotional and physical resources; depersonalization refers to one's cynical and negative tendencies toward others; and reduced personal accomplishment is defined as self-perceptions of incompetence or lack of achievement (Maslach & Leiter, 2008; Maslach, Schaufeli, & Leiter, 2001). Not only is burnout related to employee absenteeism and loss of productivity (Borritz, Rugulies, Christensen, Villadsen, & Kristensen, 2006; Nayeri, Negarandeh, Vaismoradi, Ahmadi, & Faghihzadeh, 2009), all of its three dimensions were also found to be associated with chronic stress and depressive symptoms (Steinhardt et al., 2011). Additionally, in our previous work (2012), burnout was found to be strongly and negatively associated with positive emotions.

The strongest predictors of work engagement are work meaningfulness (r = .63) and supervisor support (r = .66; May et al., 2004; Renn & Vandenberg, 1995). Work meaningfulness refers to the perceived value of work goal or purpose as it relates to an employee's personal ideals and beliefs. The absence of work meaning would leave employees feeling alienated and disengaged from their work (Aktouf, 1992). Supervisor

support, on the other hand, is characterized by the amount and quality of support, encouragement, and respect that employees receive from their supervisors. Employees with supportive supervisors felt safer and more secure at the workplace, and thus they were more engaged with their work (May et al., 2004).

Given the bipolar properties of work engagement and burnout, and considering the aforementioned associations of stress and positive emotions toward burnout, it is expected that stress would have a negative relationship with work engagement while positive emotions would be positively associated with work engagement. Although studies linking stress with burnout are in abundance (Iacovides, Fountoulakis, Kaprinis, & Kaprinis, 2003; Jamal & Baba, 2000; McManus, Keeling, & Paice, 2004; Steinhardt et al., 2011), there seems to be an absence in research directly relating stress to work engagement. Furthermore, researchers have suggested that positive emotions may be related to engagement as a simple correlation (Bakker & Demerouti, 2008) or as a mediating construct between resources and engagement (Schaufeli, Bakker, & Van Rhenen, 2009); however, how positive emotions relate to work engagement in tandem with work meaningfulness and supervisor support has not been examined.

POSTDOCTORAL FELLOWS

The university postdoctoral research fellow population is ironically under researched and underserved. It has been reported that the work and life conditions of postdocs are inundated by constant exposures to high levels of stress (Smaglik, 2006; Small, 2012) that stem from an array of stressors such as high expectations, productivity

demands, poorly standardized administrative procedures, and lack of supervisory support (Davis, 2009; Leshner, 2012). Other stressors include the impermanence of their employment assignments, pressures to publish or perish, and the fierce competitiveness of the limited job market (i.e., low supply, high demand for ideal jobs such as tenure-track professors/researchers) (Davis, 2009; Jump, 2011; Woolston, 2002). Many postdocs, due to the stressfulness of their lifestyle, suffer from mental-health problems, but are unable to obtain medical care because their employment appointment often does not offer healthcare benefits (Smaglik, 2006).

Often characterized as neither a faculty nor a student, postdocs tend to fall in the cracks and consequently receive neither the recognition nor the benefits that they feel is deserved (e.g., control over their work/funding, and health insurance for self and family) (Aschwanden, 2006; Smaglik, 2006). Considering these points, is it not surprising that postdocs describe their work and life as extremely stressful, and often filled with feelings of anxiety and depression. However, despite these grim reports, positive emotions might have the potential to help postdocs deal with their stressors as demonstrated by the aforementioned research.

Chapter 3: Sampling Methods

This chapter discusses how the participants of the present study were recruited and how data were collected. The sample's demographic characteristics and descriptive statistics are also listed here in Tables 1 through 9. The methods and information presented in this chapter apply to all three of the conducted studies, and each of these studies is furthermore discussed in chapters 4, 5, and 6.

PARTICIPANTS & PROCEDURES

Participants were recruited from a pool of postdoctoral fellows who were employed at a large research institution in Texas during February 2012. The email addresses of potential participants (n = 523) were obtained from the institution's human resources office (see Appendix A), and recruitment letters were sent via email to invite postdoctoral fellows to voluntarily participate in the online Qualtrics survey which required approximately 30 minutes to complete (see Appendices B, C, and D). The sample selection method did not have exclusion criteria, except that participants must be currently employed under a postdoctoral fellowship appointment during the time of the data collection. In order to enhance the response rate of the online survey, a variety of incentive prizes were offered (Deutskens, de Ruyter, Wetzels, & Oosterveld, 2004). Each participant was compensated with a $5 Starbucks gift card, a deck of inspirational quote cards ($2 value), and an Individual Feedback Profile document which provided a confidential report of the participant's results as well as an anonymous summary of the sample's aggregate results (see Appendix E). In addition, participants were entered into a

lottery drawing for a number of larger prizes (e.g., restaurant gift cards valued from $10 to $50, iPod Shuffles, and Amazon Touch Kindles); one prize was awarded for every 15 surveys completed. Data collection was conducted over a period of two weeks, from February 1st through 15th, 2012, and the study obtained a final sample size of n = 200 postdoctoral fellows (38% response rate). This response rate exceeded expectations as previous studies using online data collection procedures have recorded lower return rates ranging from 17% to 25% (Deutskens et al., 2004; Evans & Mathur, 2005; Sax, Gilmartin, & Bryant, 2003); a meta-analysis of 56 web-based surveys from 39 studies reported an average response rate of 35% (Cook, Heath, & Thompson, 2000). This study was approved by the Institutional Review Board (see Appendix F).

SAMPLE DEMOGRAPHIC CHARACTERISTICS

The following tables present the demographic information and statistics that were recorded by the Qualtrics online survey from the sample of postdoctoral fellows.

Table 1. Survey response rate

Study Response Rate	**38.2%**
Invited Participants	n = 523
Surveys Completed	n = 200

Table 2. Age of participants by mean, standard deviation, and range

Age (*n* = 197)	**Years**
Mean	32.06
Standard Deviation	3.71
Minimum - Maximum	26 - 52

Table 3. Sex of participants by count and proportion

Sex (*n* = 200)	***n***	**%**
Male	119	59.5%
Female	81	40.5%

Table 4. Race/Ethnicity of participants by count and proportion

Race/Ethnicity (*n* = 200)	***n***	**%**
White or Caucasian (non-Hispanic)	127	63.5%
Asian or Pacific Islander	36	18.0%
Hispanic or Latino	17	8.5%
Indian or South Asian	14	7.0%
Black or African American	1	0.5%
Other	5	2.5%

Table 5. Marital status of participants by count and proportion

Marital Status (*n* = 200)	***n***	**%**
Married	119	59.5%
Single	62	31.0%
Living with a Partner	14	7.0%
Divorced	3	1.5%
Separated	2	1.0%

Table 6. Number of children of participants by mean, standard deviation, and range

Number of Children (*n* = 200)	**#**
Mean	0.45
Standard Deviation	0.82
Minimum - Maximum	0 - 4

Table 7. Length of employment of participants by mean, standard deviation, and range

Employment Length (*n* = 200)	**Years**
Mean	1.50
Standard Deviation	1.23
Minimum	0.08
Maximum	6.67

Table 8. Employment location of participants by count and proportion

College/School of Employment (*n* = 199)	***n***	**%**
College of Natural Sciences	97	48.7%
School of Engineering	40	20.1%
College of Liberal Arts	15	7.5%
School of Geosciences	11	5.5%
College of Pharmacy	10	5.0%
College of Education	3	1.5%
College of Communication	2	1.0%
School of Public Affairs	2	1.0%
School of Social Work	2	1.0%
Other	17	8.5%

Table 9. Nationality/Country of Origin of participants by count and proportion

Nationality/Country of Origin (*n* = 200)	***n***	**%**
USA	101	50.5%
China	21	10.5%
India	13	6.5%
South Korea	8	4.0%
United Kingdom	7	3.5%
Canada	6	3.0%
Germany	5	2.5%
Israel	5	2.5%
France	4	2.0%
Iran	4	2.0%
Spain	3	1.5%
Taiwan	2	1.0%
Italy	2	1.0%
Mexico	2	1.0%
Argentina	1	0.5%
Australia	1	0.5%
Brazil	1	0.5%
Chile	1	0.5%
Czech Republic	1	0.5%
Denmark	1	0.5%
Georgia	1	0.5%
Japan	1	0.5%
Lebanon	1	0.5%
The Netherlands	1	0.5%
Palestine	1	0.5%
Peru	1	0.5%
Poland	1	0.5%
Romania	1	0.5%
Singapore	1	0.5%
Sri Lanka	1	0.5%
Venezuela	1	0.5%

Chapter 4: Study I - Positive Emotions Enhance Coping, Fuel Resilience, and Protect Individuals Against the Harmful Effects of Stress: Implications of the Broaden-and-Build Theory

ABSTRACT

The broaden-and-build theory of positive emotions posits that positive emotions widen the range of potential coping strategies that come to mind, and enhance one's resilience against stress. Studies have shown that high stress, especially chronic levels of stress, strongly contributes to the development of anxiety and depressive symptoms. Individuals who possess high levels of resilience are protected from stress and thus report lower levels of anxiety and depressive symptoms. Using a sample of 200 postdoctoral research fellows, the present study examined if (a) positive emotions fueled resilience, (b) coping strategies mediated the link between positive emotions and resilience, and (c) resilience moderated the influence of stress on trait anxiety and depressive symptoms. Results support the broaden-and-build theory that positive emotions enhance resilience directly as well as indirectly through the mediating role of coping strategies—particularly adaptive coping. Resilience also moderated the association of stress with trait anxiety and depressive symptoms. Although stress is unavoidable and its influences on anxiety and depressive symptoms are undeniable, the likelihood of postdocs developing anxiety or depressive symptoms may be reduced by implementing programs designed to increase positive emotions, adaptive coping, and resilience.

Keywords: positive emotions, coping, resilience, stress, anxiety, depression, postdocs

INTRODUCTION

Growing research guided by the broaden-and-build theory of positive emotions continues to find evidence in support of the notion that positive emotions have the ability to widen the range of potential coping strategies that come to one's mind during times of stress, consequently enhancing their resilience against present as well as future adversity (Folkman & Moskowitz, 2000; Fredrickson, 2004, 2005; Tugade et al., 2004). According to Fredrickson (2001), the experience of positive emotions effectually opens one's mind and encourages individuals to think more freely, thoughtfully, and creatively. These effects, in turn, expand one's outlook and allow individuals to see the world with a broader perspective. As a result, those who experience greater frequencies of positive emotions have an improved ability to recognize a wider range of possible coping strategies when faced with adversity; therefore, they demonstrate greater resilience and are able to tackle stress more effectively (Cohn, Fredrickson, Brown, Mikels, & Conway, 2009; Fredrickson, 2009a; Gloria et al., 2012).

During stressful situations, the human mind and body instinctively trigger the fight-or-flight response, which activates an array of physical and psychological reactions including increased heart rate, blood pressure, and respiration. In addition, one's mindset and worldview dramatically narrows and sharply focuses toward the triggering stressor (Kok et al., 2008). These evolutionarily adaptive reactions serve critical purposes for

survival, particularly during threatening and stressful situations that compel individuals to make instantaneous decisions to either fight or flee from the danger (Fredrickson, 2001). Although the fight-or-flight response can be beneficial toward temporary stressors, long-term exposure is harmful to health. When individuals are exposed to enduring forms of stress, the physiological and psychological reactions of the fight-or-flight response are likewise sustained over time. This heightened and enduring state of stress beyond homeostasis increase one's risks for a number of health problems including cardiovascular disease (Iso et al., 2002; Jood et al., 2009), obesity (de Luca & Olefsky, 2006), diabetes (Lloyd et al., 2005), immune disease (Kemeny & Schedlowski, 2007), burnout (Lloyd et al., 2002), anxiety (Kleppa et al., 2008), and depression (Nielsen et al., 2008; Steinhardt et al., 2011).

Anxiety and depression are of particular concern, considering their strong associations with perceived stress (Newbury-Birch & Kamali, 2001; Rawson et al., 1994). Studies have shown that high stress strongly contributes to the development of anxiety and depressive symptoms (Kleppa et al., 2008; Markou & Cryan, 2012; Melchior et al., 2007; Misra & McKean, 2000; Steinhardt et al., 2011). Anxiety and depressive symptoms can be debilitating, and harms not only the individual experiencing such symptomology, but also affects others. Those who suffer from anxiety and depressive symptoms have increased morbidity and mortality risks (Carney & Freedland, 2003; Mykletun et al., 2007), and are likely to have deteriorating interpersonal relationships (Insel & Roth, 2012); moreover, they have higher rates of absenteeism in tandem with decreased productivity at the workplace (Stewart et al., 2003).

Importantly, there is evidence showing that individual resilience can moderate the impact of stress on anxiety and depression (Aroian & Norris, 2000; Wagnild, 2003). Research has also demonstrated that positive emotions improve coping (Burns et al., 2008), and improved coping subsequently enhances resilience (Tugade et al., 2004). However, to our knowledge, no studies have investigated how positive emotions influence different types of coping strategies (viz., adaptive and maladaptive). Adaptive coping strategies (e.g., active coping, planning, and positive reframing) are actions and behaviors used in response to stress which lead to improved outcomes. In contrast, maladaptive coping strategies (e.g., denial, venting, and substance abuse) lead to undesirable or even worse outcomes (S. P. Brown et al., 2005; Carver, 1997; Zeidner & Saklofske, 1996). Therefore, the purpose of the present study was to examine if (a) positive emotions fueled resilience; (b) coping strategies mediated the link between positive emotions and resilience; and (c) resilience moderated the influence of stress on trait anxiety and depressive symptoms (i.e., as levels of stress increase, individuals with higher scores of resilience will report lower levels of trait anxiety or depressive symptoms as compared to those with lower resilience).

METHODS

Participants and Procedures

Participants were recruited from a pool of postdocs who were employed at a large research institution in Texas during February 2012. The email addresses of potential participants (n = 523) were obtained from the institution's human resources office, and

recruitment letters were sent via email inviting postdocs to voluntarily participate in a Qualtrics online survey that required approximately 30 minutes to complete. The sample selection method did not have exclusion criteria, except that participants must be currently employed under a postdoctoral research fellowship appointment during the time of data collection.

In order to enhance the survey response rate, a variety of incentive prizes were offered (Deutskens et al., 2004). Each participant was compensated with a $5 Starbucks gift card, a deck of inspirational quote cards ($2 value), and an *Individual Feedback Profile* document which provided a confidential report of the participant's results as well as an anonymous summary of the sample's aggregate results. In addition, participants were entered into a lottery drawing for a number of larger prizes (e.g., restaurant gift cards valued from $10 to $50, iPod Shuffles, and Amazon Touch Kindles); one prize was awarded for every 15 surveys completed. The present study was approved by the Institutional Review Board.

Measures

The online survey assessed participants' demographic characteristics, positive emotions, adaptive and maladaptive coping strategies, resilience, stress, trait anxiety, and depressive symptoms. Each of these variables is further discussed in the following sections, and a copy of the survey may be requested from the corresponding author.

Demographics

Participants were asked to report a variety of personal characteristics including age, sex, race/ethnicity, marital status, number of children, college/school (i.e., location of employment), employment length, and nationality (i.e., country of origin). Because these demographic characteristics may be related to the dependent variables, the present study used them as covariates in the regression analyses.

Positive Emotions

The participants' experienced positive emotions were measured by the 10-item positive emotions subscale of the Modified Differential Emotions Scale (mDES; Fredrickson et al., 2003). Each item asked participants to recall how often they have experienced particular sets of positive emotions during the previous two weeks (e.g., "In the past two weeks, I have felt amused, fun-loving, or silly."); response options ranged on a five-point scale from 0 (*never*) to 4 (*most of the time*). The positive emotions score was calculated as the sum of the 10 items; scores ranged from 0 to 40, with higher scores indicating higher frequencies of experienced positive emotions. Internal reliability for the positive emotion scale was found to be acceptable in previous research (α = .79; Fredrickson et al., 2003), and reliability was very good in the present study (α = .87).

Coping Strategies

The Brief Coping Orientations to Problems Experienced (Brief COPE) scale was used to measure the participants' utility of different coping strategies (Carver, 1997).

This instrument included six adaptive coping subscales (viz., active coping, planning, positive reframing, acceptance, emotional support, and instrumental support) and six maladaptive coping subscales (viz., self-distraction, denial, venting, substance use, behavioral disengagement, and self-blame). Each subscale was measured by two items, and participants were asked to report how often they have used certain coping strategies during stressful experiences, using a four-point response scale ranging from 1 (*not at all*) to 4 (*a lot*).

Sample adaptive coping items include "I concentrate my efforts on doing something about the situation I'm in" (active coping); "I try to come up with a strategy about what to do" (planning); "I try to see it in a different light, to make it seem more positive" (positive reframing); "I accept the reality of the fact that it happened" (acceptance); "I try to get emotional support from others" (emotional support); and "I try to get advice or help from other people about what to do" (instrumental support). Sample maladaptive coping items include "I turn to other activities to take my mind off things" (self-distraction); "I say to myself 'this isn't real'" (denial); "I say things to let my unpleasant feelings escape" (venting); "I use alcohol or other drugs to make myself feel better" (substance use); "I just give up trying to deal with it" (behavioral disengagement); and "I criticize myself" (self-blame).

The scores for either the adaptive or maladaptive coping strategies was calculated as the sum of the 12 items (ranging from 12 to 48); higher scores represent greater use of the particular set of coping strategies. In previous research, the internal reliability of the adaptive subscale was good ($\alpha = .83$) and the maladaptive subscale was acceptable ($\alpha =$

.75; Hastings & Brown, 2002); the present study recorded alpha coefficients of .77 and .66 for the adaptive and maladaptive subscales, respectively.

Resilience

Participant resilience was assessed using the six-item Brief Resilience Scale (BRS; Smith et al., 2008). On a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), respondents indicated the extent to which they agreed with statements that evaluated their personal resilience or ability to recover from stress (e.g., "I tend to bounce back quickly after hard times," "It does not take me long to recover from a stressful event," and "I usually come through difficult times with little trouble."). The resilience score was calculated as the mean of the six items; scores ranged from 1 to 5, with higher scores indicating higher levels of resilience. This scale demonstrated good to excellent internal reliability as reported by previous research with Cronbach's alphas ranging from .80 to .91 (Smith et al., 2008); the present study also found the scale to be reliable at $\alpha = .89$.

Stress

This variable was assessed using the 10-item Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988), which measured the appraised stressfulness of the respondents' life situations. The scale items asked participants to rate how often stressful events occurred during the past month on a five-point scale from 0 (*never*) to 4 (*very often*). Sample items include "How often have you been upset because of something that happened unexpectedly?," "How often have you felt that you were unable to control the

important things in your life?," and "How often have you felt difficulties were piling up so high that you could not overcome them?" The stress score was calculated as the sum of the 10 items, ranging from 0 to 40, with higher scores representing higher levels of stress. Previous research found the internal reliability of the PSS-10 to range from acceptable (α = .78) to excellent (α = .91; Cohen & Janicki-Deverts, 2012), and the reliability from the present study was estimated at α = .86.

Trait Anxiety

The 20-item trait anxiety subscale of the State-Trait Anxiety Inventory for Adults (STAI; Spielberger et al., 1968, 1977) was used to measure the participants' tendency to appraise stressful events as threatening and thus respond with heightened levels of state anxiety reactions (Spielberger et al., 1983). Using a four-point scale ranging from 1 (*almost never*) to 4 (*almost always*), participants responded to items including, "I feel nervous and restless," "I feel like a failure," and "I get in a state of tension or turmoil as I think over my recent concerns and interests." Scores for this variable were calculated as the sum of the 20 items, ranging from 20 to 80, with higher scores representing higher levels of trait anxiety. Researchers cautioned that having a trait anxiety score of 43 or higher could signify the presence of an anxiety disorder (Van Dam et al., 2011). The trait anxiety subscale demonstrated very good to excellent internal reliability, with Cronbach's alphas ranging from .89 to .91 (Spielberger et al., 1983); the present study also recorded an excellent reliability score at α = .91.

Depressive Symptoms

The Center for Epidemiologic Studies Depression (CES-D) scale was used to assess the participants' level of experienced depressive symptoms (Radloff, 1977). Consisting of 20 items, the instrument assessed how often respondents felt a variety of depressive symptoms during the previous week. Using a four-point scale ranging from 0 (*rarely or none of the time; less than 1 day*) to 3 (*most or all of the time; 5-7 days*), participants responded to statements such as "I was bothered by things that usually don't bother me," "I did not feel like eating; my appetite was poor," and "I had trouble keeping my mind on what I was doing." The CES-D score was calculated as the sum of the 20 items, ranging from 0 to 60, with higher scores representing higher levels of experienced depressive symptoms. A score of 16 or greater is considered a moderately severe level of symptoms and could be a marker for clinical depression (Radloff, 1977). Previous research found the internal consistency of the scale ranged from good to excellent (α = .85-.90; Radloff, 1977), and the present study also demonstrated very good reliability at α = .86.

Data Analyses

All analyses were completed using the Statistical Package for the Social Sciences (SPSS) software version 21, and mean substitution was used to replace missing data. Using the procedures detailed by Pallant (2010), preliminary tests were performed to ensure that the statistical assumptions of normality, linearity, outliers, multicollinearity,

independence, and homoscedasticity were satisfied before the regression analyses were conducted.

Descriptive Statistics and Correlations

Means, standard deviations, and bivariate correlations of all study variables were calculated using descriptive statistics, Pearson correlations for continuous variables, point-biserial correlations for continuous and dichotomous variables, and chi-square tests for pairs of dichotomous variables.

Mediation Analysis

In order to test the direct and indirect associations among positive emotions, adaptive and maladaptive coping strategies, and resilience, path analysis was performed with Preacher and Hayes' (2008) Model INDIRECT script using bootstrap estimation. Demographic variables (viz., age, number of children, employment length, sex, marital status, college/school, race/ethnicity, and nationality) were also included in the model as covariates.

As depicted in Figure 1, the relationship between positive emotions and resilience was hypothesized to be mediated by the two subscales of coping strategies (viz., adaptive and maladaptive) while controlling for the demographic variables. Therefore, this model examined several types of effects: the *direct* effects of positive emotions on resilience and each of the two subscales of coping strategies, as well as the *direct* effects of the two subscales of coping strategies on resilience; the *specific indirect* effect of positive emotions on resilience through each subscale of coping strategies (i.e., the unique

mediating effect of each subscale of coping strategies, while controlling for the other subscale); the *total indirect* effect of positive emotions on resilience (i.e., the sum of each of the two specific indirect effects); and the *total* effect of positive emotions on resilience (i.e., the sum of the direct and total indirect effect). For indirect paths, this analysis produced point estimates and three varieties of 95-99% confidence intervals (viz., percentile, bias corrected, and bias corrected and accelerated) from 5,000 bootstrap samples. Pairwise comparison of the indirect effects was also performed to determine if a particular mediator has a significantly stronger unique indirect effect than the other mediator.

Moderation Analysis

Guided by Aiken and West's interaction analysis method (1991), hierarchical multiple regression was used to examine the moderating effect of resilience on the association between stress and the dependent variables (viz., trait anxiety and depressive symptoms); each of the dependent variables was tested individually using separate models. Demographic variables (viz., age, number of children, employment length, sex, marital status, college/school, race/ethnicity, and nationality) were also included in each of the models as covariates.

Prior to analysis, values of all continuous predictors were centered to prevent potential problems associated with multicollinearity (Aiken & West, 1991). The hierarchical model of the multiple regression analysis consisted of three steps. In the first step, the demographic covariates were entered in the regression of the dependent variable.

The second step involved the addition of the focal predictors, namely stress and resilience. In the third and final step, the interaction term between stress and resilience—stress x resilience—was entered into the model. This three-step process was independently conducted for the regression of each of the dependent variables (viz., trait anxiety and depressive symptoms) on the set of predictors.

RESULTS

Descriptive Analysis

Data collection was conducted over a period of two weeks and the study obtained a sample size of n = 200 postdocs (38% response rate). This response rate exceeded expectations as previous studies with similar methods recorded lower return rates ranging from 17% to 25% (Deutskens et al., 2004; Evans & Mathur, 2005; Sax et al., 2003); a meta-analysis of 56 web-based surveys from 39 studies reported an average response rate of 35% (Cook et al., 2000). However, due to partially missing demographic data (viz., age and college/school), four of the participants were dropped from the analyses, resulting in a final sample size of n = 196; three missing data points related to positive emotions and one from depressive symptoms were replaced via mean substitution.

Participants were primarily male (59.5%) with a mean age of 32 years, ranging from 26 to 52 years. In terms of race/ethnicity, 63.5% were non-Hispanic White or Caucasian, 18% Asian or Pacific Islander, 8.5% Hispanic or Latino, 7% Indian or South Asian, 0.5% Black or African American, and 2.5% other. The majority were married (59.5%), 31% were single, 7% were living with a partner, and the remaining 2.5% were

either divorced or separated. Their family sizes ranged from having zero to four children; 71% had no children, 18.5% had one, 6% had two, 4% had three, and one participant had four children. The participants were employed as postdocs for an average of 1.5 years, and ranged from 1 year to 6 years and 8 months. The majority worked in the college of natural sciences (48.5%), 20% in engineering, 7.5% in liberal arts, 5.5% in geosciences, 5% in pharmacy, and the remaining were in communication, education, public affairs, social work, or other. Most of the postdocs originated from the United States (US) (50.5%), 10.5% China, 6.5% India, 4% South Korea, 3.5% United Kingdom, 3% Canada, and the remaining were from 25 other countries around the globe.

Prior to the regression analyses, multiple-category demographic variables were collapsed into binary variables to produce appropriately sized groups: marital status (1 = *married,* 0 = *unmarried*), college/school (1 = *natural sciences,* 0 = *other*), race/ethnicity (1 = *non-Hispanic White/Caucasian,* 0 = *other*), and nationality (1 = *from US,* 0 = *other*). Age, number of children, and employment length were retained as continuous variables.

Table 10 displays the means, standard deviations, and correlations for all study variables. Positive emotions, adaptive coping, and maladaptive coping were moderately correlated with resilience. Interestingly, adaptive coping strategies were found to be unrelated to maladaptive coping strategies, although previous research has reported a moderate correlation (r = .30, p < .01; Meyer, 2001). The strongest correlations were among stress, trait anxiety, and depressive symptoms. Among the demographic control variables, on average, US nationals used more maladaptive coping and were more resilient than non-US nationals; females reported greater use of adaptive coping; being

married or having children was negatively associated with maladaptive coping; and married postdocs reported fewer depressive symptoms.

Table 10. Means, standard deviations (SD), and bivariate correlations for all variables (n = 196).

Variable	Mean	SD	PE	AC	MC	R	S	TA	DS	A	NC	EL	F	M	NS	W	US
Positive Emotions (PE)	24.23	6.02	--														
Adaptive Coping (AC)	36.53	4.87	.44***	--													
Maladaptive Coping (MC)	21.41	3.83	-.15*	-.02	--												
Resilience (R)	3.62	.70	.38***	.38***	-.29***	--											
Stress (S)	16.18	5.79	-.47***	-.19**	.34***	-.45***	--										
Trait Anxiety (TA)	39.74	9.14	-.53***	-.38***	.46***	-.61***	.77***	--									
Depressive Symptoms (DS)	10.61	7.59	-.49***	-.24**	.44***	-.42***	.72***	.75***	--								
Control																	
Age (A)	32.08	3.71	.08	.04	-.03	.10	-.04	-.05	-.01	--							
Number of Children (NC)	.44	.82	.09	.05	-.18*	.10	-.00	-.10	-.12	.46***	--						
Employment Length (EL)	1.49	1.23	-.13	-.14	-.07	.13	.04	.09	.04	.26***	.16*	--					
Female (F)†	--	--	.02	.22**	.07	.02	.01	-.03	-.08	-.04	.01	-.17*	--				
Married (M)†	--	--	.01	.04	-.19**	.13	-.06	-.13	-.18*	.14	.43***	.15*	.04	--			
Natural Sciences (NS)†	--	--	.01	-.03	-.13	.11	-.11	-.06	-.10	.01	.05	.21**	-.00	.12	--		
White (W)†	--	--	.05	-.07	.10	.11	-.07	-.09	.01	.03	.08	.02	.09	-.07	-.05	--	
US American (US)†	--	--	-.02	.06	.15*	.16*	-.02	-.02	.06	.00	.01	.02	.21**	-.03	.02	.48***	--

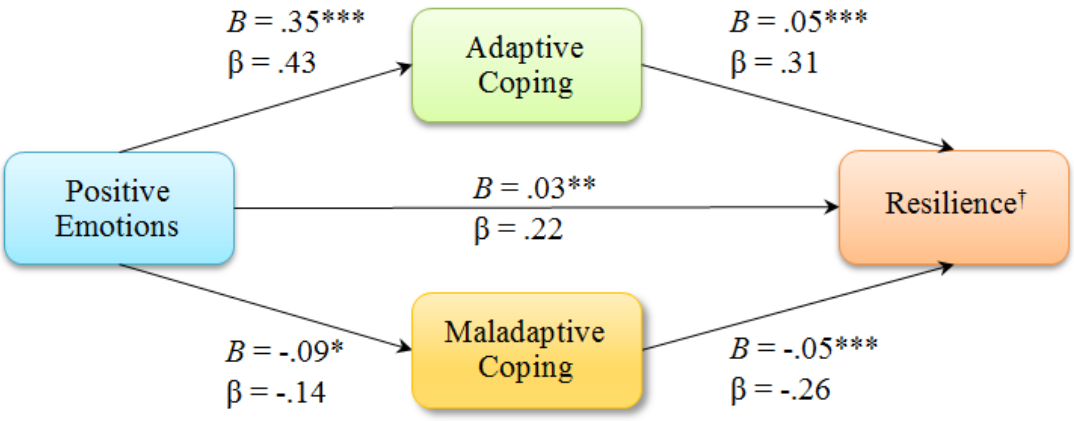
†Sex (Female = 1, Male = 0); Marital Status (Married = 1, Unmarried = 0); College/School (Natural Sciences = 1, Other = 0); Race/Ethnicity (White = 1, Other = 0); Nationality (US = 1, Other = 0).
*p < .05, **p < .01, ***p < .001

Mediation Model

In terms of the direct effects shown in Figure 7, postdocs who experienced higher degrees of positive emotions used more adaptive coping (B = .35, β = .43, p < .001) and less maladaptive coping strategies (B = -.09, β = -.14, p < .05). Adaptive coping was positively related to resilience (B = .05, β = .31, p < .001), whereas maladaptive coping had a negative association with resilience (B = -.05, β = -.26, p < .001). After controlling for the two constructs of coping strategies and the set of demographic covariates, the direct relationship between positive emotions and resilience remained significant (B = .03, β = .22, p < .01), indicating that coping strategies did not completely mediate the link between positive emotions and resilience. Among the control variables, only employment length (B = .09, β = .15, p < .05) and nationality (B = .21, β = .30, p < .05) had significant associations with resilience.

As for specific indirect effects, the indirect effects of positive emotions on resilience were significant through both mediators: adaptive coping (B = .02, β = .14, p < .01), maladaptive coping (B = .004, β = .04, p < .05). Pairwise comparison of the two indirect effects indicated that the mediating path through adaptive coping was significantly stronger than through maladaptive coping (p < .05). Combining together the direct and indirect effects via coping strategies, the total effect of positive emotions on resilience was estimated at B = .05, β = .39, p < .001. The overall model accounted for 34% of the total variance in resilience.

Figure 7. Conceptual model of coping strategies partially mediating the relationship between positive emotions and resilience with unstandardized (*B*) and standardized (β) coefficients (*n* = 196).



Indirect effect of positive emotions on resilience, B = .02, β = .17**
Total effect of positive emotions on resilience, B = .05, β = .39***
Model R^2 = .34***

Note: *p < .05, **p < .01, ***p < .001
†Controlling for age, number of children, employment length, sex, marital status, college/school, race/ethnicity, and nationality.

Moderation Model

Trait Anxiety

As displayed in Table 11, the demographic control variables (viz., age, number of children, employment length, sex, marital status, college/school, race/ethnicity, and nationality) were entered into Model 1, but they did not significantly account for any variance in trait anxiety ($F_{8, 187} = 1.21$, $p > .05$). Following the addition of stress and resilience in Model 2, the total variance explained was estimated at 70% ($F_{10, 185} = 42.92$, $p < .001$). In the final step, Model 3, both stress ($B = .96$, $p < .001$) and resilience ($B = -4.77$, $p < .001$) were associated with trait anxiety. To determine the role of resilience in moderating the association of stress on trait anxiety, the interaction term (stress x resilience) was also included in the final model. The analysis revealed a significant interaction effect ($B = -.31$, $p < .001$), indicating that resilience moderated the relationship between stress and trait anxiety. The final model explained an additional 2%, and accounted for a total of 72% of the variance in trait anxiety ($F_{11, 184} = 43.53$, $p < .001$).

Table 11. Hierarchical regression of trait anxiety on controls, focal predictors, and the interaction term (n = 196).

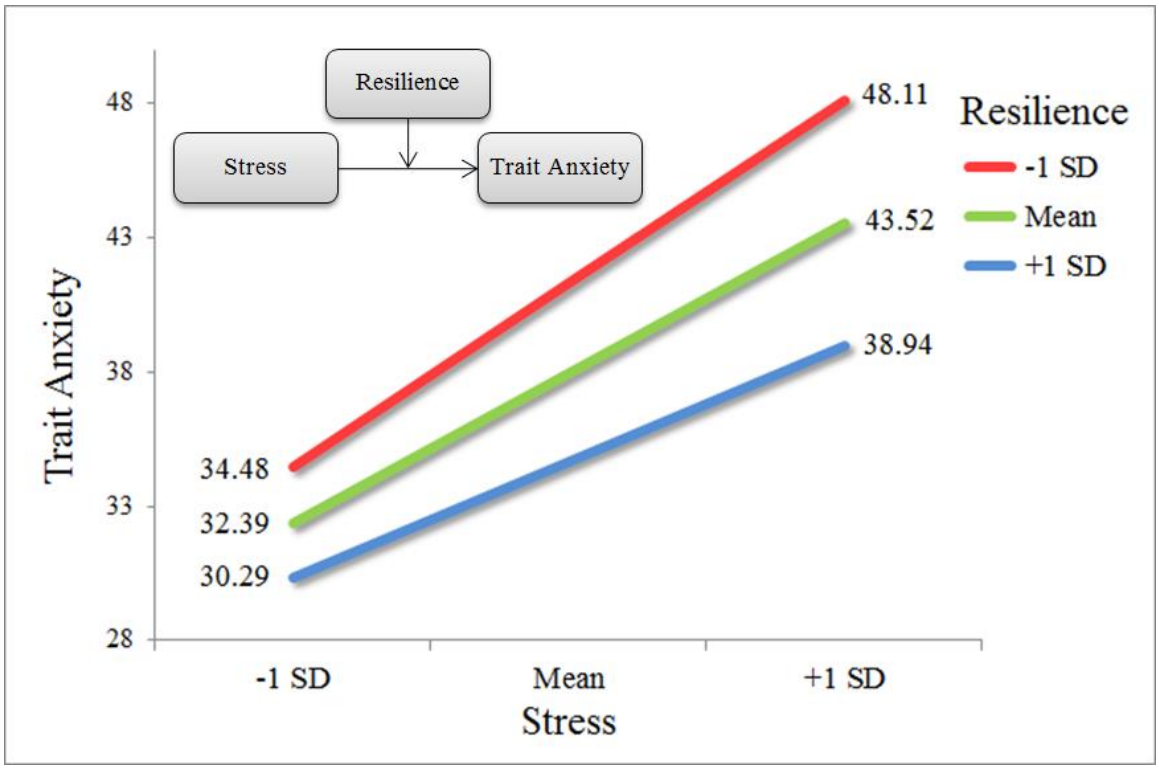
	Model 1			Model 2			Model 3		
Variable	*B*	SE *B*	β	*B*	SE *B*	β	*B*	SE *B*	β
Age	-.11	.20	-.04	.05	.12	.02	.01	.11	.01
Number of Children	-.39	.99	-.04	-.79	.56	-.07	-.64	.54	-.06
Employment Length	1.10	.57	.15	.88	.33	.12**	.99	.32	.13**
Female †	.09	1.38	.01	-.25	.78	-.01	.07	.76	.00
Married †	-2.34	1.49	-.13	.74	.85	-.04	-.59	.82	-.03
Natural Sciences †	-1.50	1.34	-.08	.33	.76	.02	.29	.74	.02
White †	-2.16	1.56	-.11	-.67	.89	-.04	-.92	.85	-.05
US American †	.52	1.51	.03	1.13	.86	.06	1.34	.83	.07
Stress				.95	.07	.60***	.96	.07	.61***
Resilience				-4.64	.61	-.35***	-4.77	.59	-.36***
Stress X Resilience							-.31	.08	-.16***
Model R^2			.05			.70			.72
F for change in R^2			1.21			199.44***			15.65***

†Sex (Female = 1, Male = 0); Marital Status (Married = 1, Unmarried = 0); College/School (Natural Sciences = 1, Other = 0); Race/Ethnicity (White = 1, Other = 0); Nationality (US = 1, Other = 0).

*p < .05, **p < .01, ***p < .001

Post hoc probing of the significant interaction was conducted according to the methods of Aiken and West (1991). Plotting the interaction was performed to illustrate the regression of trait anxiety on varying degrees of stress and resilience. As shown in Figure 8, levels of stress and resilience were estimated at one standard deviation below and above their means as recommended by Aiken and West. Results showed that the simple slopes from all three levels of resilience—at -1 SD, mean, and +1 SD—were statistically significant ($p < .001$). The graph indicated that increasing levels of stress was likewise associated with increasing levels of trait anxiety. However, as suggested by the significant interaction effect, resilience appeared to have a moderating effect on the link between stress and trait anxiety. In other words, postdocs with higher levels of resilience seemed to be protected from the impact of stress, and thus explaining their lower scores of trait anxiety as compared to those with lower levels of resilience. The protective role of resilience was apparent across all levels of stress, but the degree of protection was largest when stress levels were highest. Considering the cutoff score of 43 or higher, signifying the possible presence of an anxiety disorder (Van Dam et al., 2011), the data revealed that postdocs with high levels of resilience remained below the cutoff score even when stress levels were high.

Figure 8. The moderating effect of resilience on the relationship between stress and trait anxiety.



Depressive Symptoms

As displayed in Table 12, the demographic control variables (viz., age, number of children, employment length, sex, marital status, college/school, race/ethnicity, and nationality) were entered into Model 1, but they did not significantly account for any variance in depressive symptoms ($F_{8, 187} = 1.49$, $p > .05$). Following the addition of stress and resilience in Model 2, the total variance explained was estimated at 58% ($F_{10, 185} = 25.38$, $p < .001$). In the final step, Model 3, both stress ($B = .90$, $p < .001$) and resilience ($B = -1.40$, $p < .05$) were associated with depressive symptoms. To determine the role of resilience in moderating the association of stress on depressive symptoms, the interaction term (stress x resilience) was also included in the final model. The analysis revealed a significant interaction effect ($B = -.28$, $p < .001$), indicating that resilience moderated the relationship between stress and depressive symptoms. The final model explained an additional 3%, and accounted for a total of 61% of the variance in depressive symptoms ($F_{11, 184} = 25.81$, $p < .001$).

Table 12. Hierarchical regression of depressive symptoms on controls, focal predictors, and the interaction term (n = 196).

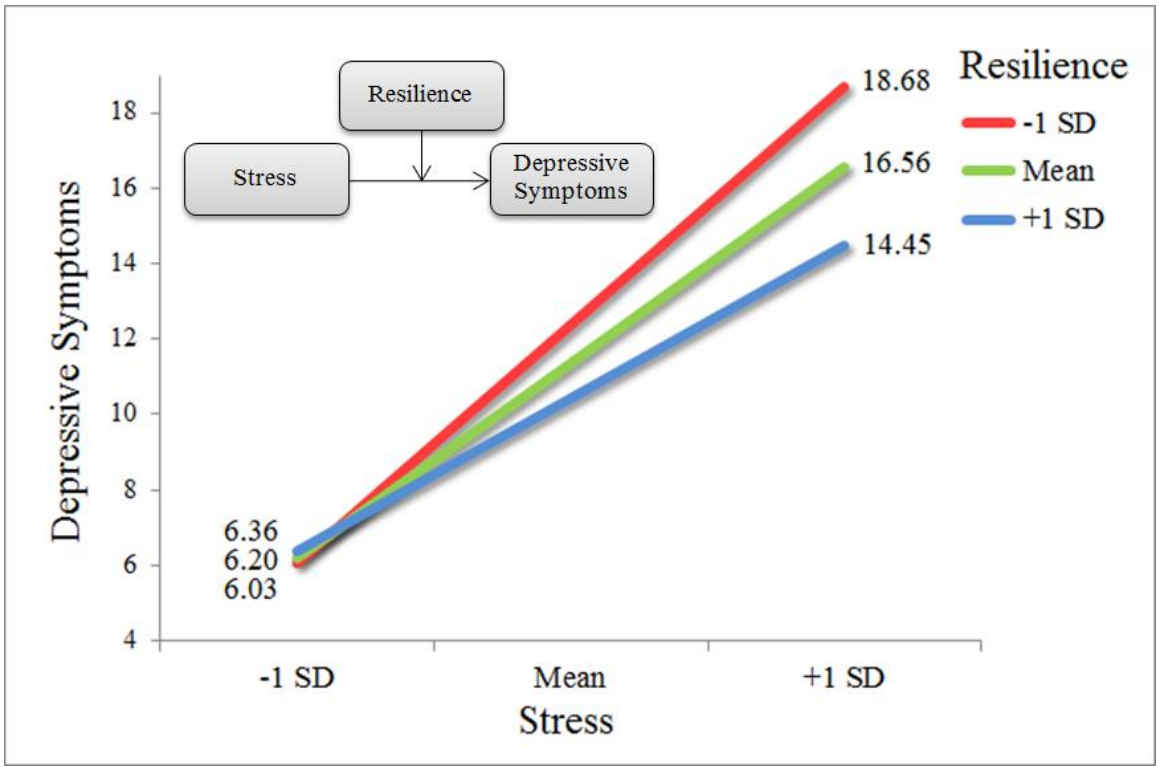
	Model 1			Model 2			Model 3		
Variable	*B*	SE *B*	β	*B*	SE *B*	β	*B*	SE *B*	β
Age	.06	.17	.03	.18	.11	.09	.15	.11	.07
Number of Children	-.70	.82	-.08	-1.09	.55	-.12	-.95	.54	-.10
Employment Length	.44	.47	.07	.10	.32	.02	.21	.31	.03
Female †	-1.21	1.14	-.08	-1.52	.77	-.10*	-1.22	.75	-.08
Married †	-2.29	1.23	-.15	-1.25	.83	-.08	-1.12	.81	-.07
Natural Sciences †	-1.50	1.11	-.10	-.13	.75	-.01	-.17	.73	-.01
White †	-.54	1.29	-.03	.59	.87	.04	.36	.84	.02
US American †	1.32	1.25	.09	1.34	.85	.09	1.53	.82	.10
Stress				.88	.07	.67***	.90	.07	.68***
Resilience				-1.27	.60	-.12*	-1.40	.59	-.13*
Stress X Resilience							-.28	.08	-.17***
Model R^2			.06			.58			.61
F for change in R^2			1.49			113.77***			13.28***

†Sex (Female = 1, Male = 0); Marital Status (Married = 1, Unmarried = 0); College/School (Natural Sciences = 1, Other = 0); Race/Ethnicity (White = 1, Other = 0); Nationality (US = 1, Other = 0).

*p < .05, **p < .01, ***p < .001

Post hoc probing of the significant interaction was conducted according to methods of Aiken and West (1991). Plotting the interaction was performed to illustrate the regression of depressive symptoms on varying levels of stress and resilience. As shown on Figure 9, levels of stress and resilience were estimated at one standard deviation below and above their means. Results showed that the simple slopes from all three levels of resilience—at -1 SD, mean, and +1 SD—were statistically significant ($p <$ .001). The graph indicated that increasing levels of stress was likewise associated with increasing levels of depressive symptoms. However, as suggested by the significant interaction effect, resilience appeared to have a moderating effect on the link between stress and depressive symptoms. Particularly when stress levels are high, postdocs with higher levels of resilience seemed to be protected from the impact of stress, and thus explaining their lower scores of depressive symptoms as compared to those with lower levels of resilience. Importantly, the protective role of resilience appeared to be unimportant when stress levels were low, but the degree of protection became more apparent as stress levels increased. Considering the cutoff score of 16 or higher (suggesting moderately severe level of symptoms and a possible marker for clinical depression), results indicated that postdocs with high levels of resilience remained below this criterion even when stress levels were high.

Figure 9. The moderating effect of resilience on the relationship between stress and depressive symptoms.



DISCUSSION

Using a sample of n = 200 postdocs, the present study was conducted to (a) examine if positive emotions fueled resilience, (b) test whether coping strategies mediated the link between positive emotions and resilience, and (c) investigate if resilience moderated the influence of stress on trait anxiety and depressive symptoms, after controlling for a variety of demographic variables (viz., age, number of children, employment length, sex, marital status, college/school (i.e., location of employment), and nationality (i.e., country of origin). As hypothesized, there was a positive association between positive emotions and resilience, and coping strategies partially mediated the link between positive emotions and resilience. Results also indicated that resilience moderated the impact of stress on trait anxiety and depressive symptoms.

With respect to the broaden-and-build theory of positive emotions, findings from the mediation analysis provided further support for the theory's build hypothesis (Fredrickson, 2004, 2005; Kok et al., 2008), as demonstrated by the significant direct associations of positive emotions toward resilience and coping strategies. Positive emotions' positive link with adaptive coping strategies, and negative relationship with maladaptive strategies, indicated that positive emotions may have the ability to enhance adaptive coping while minimizing maladaptive coping strategies. An increase in adaptive coping in conjunction with a decrease in maladaptive coping, in turn, would consequently have a building influence on resilience. These relationships lend support for the theory's proposition that positive emotions may have the ability to fuel resilience through

effective coping (Tugade et al., 2004). In addition, the direct association between positive emotions and resilience indicate that positive emotions may not only fuel resilience, but that resilience may also increase positive emotions, supporting the theory's hypothesis that their reciprocal relationship between positive emotions and resilience could spark the upward spiral toward increasing emotional well-being (Fredrickson & Joiner, 2002); the same argument may also apply for the upward spiral between positive emotions and coping (Burns et al., 2008). Therefore, in order to optimize resilience among postdocs, it is important to implement programs that would aim to increase individual use of adaptive coping strategies, decrease use of maladaptive coping strategies, and increase experiences of positive emotions

As for the moderation analyses, results confirm the buffering hypothesis of Fredrickson's broaden-and-build theory (Kok et al., 2008). In line with expectations, resilience demonstrated a moderating role toward the impact of stress on trait anxiety and depressive symptoms, as found in previous research (Aroian & Norris, 2000; Pinquart, 2009; Wagnild, 2003). That is to say, as stress levels increased, levels of trait anxiety and depressive symptoms also increased; however, individuals with higher levels of resilience exhibited some level of protection, as demonstrated by their lower scores of trait anxiety or depressive symptoms, compared to other participants who possessed lower levels of resilience.

Regarding trait anxiety, postdocs with higher resilience appeared to be protected across the full range of stress; even when stress is low, postdocs with high resilience already had lower scores on trait anxiety, and the degree of protection—or the difference

in trait anxiety between low and high resilience—further increased as stress was magnified. In contrast, with respect to depressive symptoms, one's level of resilience did not seem to be important when stress levels are low; however, having high levels of resilience protected postdocs from developing depressive symptoms as stress levels increased. Interestingly, those with average or low levels of resilience were projected to have trait anxiety and depressive symptoms scores that were above the tipping points for possible cases of anxiety disorder (Van Dam et al., 2011) or clinical levels of depression (Radloff, 1977). In sum, although stress is unavoidable and the associations among stress, anxiety, and depression are undeniable, the link between postdocs and whether they will develop anxiety or depression may be ameliorated by implementing programs designed to increase their resilience, adaptive coping, and positive emotions.

Results from the present study should be considered in light of the following limitations. The present study used cross-sectional data, and thus causality and directionality cannot be determined from the found associations among the variables. It is also possible that the data may be vulnerable to inaccuracies due to common-methods bias and the self-report nature of the survey instrument. The participants were recruited from a pool of postdocs who were employed at a large research institution in the state of Texas during the spring of 2012. There were no exclusion criteria, and all postdocs from any college or department across the university were allowed to participate. Due to this localized sampling, results and implications may not be applicable to postdocs from other institutions, locations, or time periods.

In conclusion, findings from the present study provide additional support for the build and buffering hypotheses of the broaden-and-build theory of positive emotions. Results suggested that positive emotions may fuel resilience directly, as well as indirectly by promoting adaptive coping and demoting maladaptive coping strategies. Although stress was strongly associated with trait anxiety and depressive symptoms, having higher levels of resilience could protect postdocs from developing clinical levels of anxiety and depression. In order to maintain and enhance the well-being of postdocs, programs should be implemented to increase their positive emotions, adaptive coping, and resilience.

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Chapter 5: Study II - Flourishing, Languishing, and Depressed Postdoctoral Fellows: Differences in Stress, Trait Anxiety, and Depressive Symptoms

ABSTRACT

Based on the broaden-and-build theory of positive emotions, researchers discovered a mathematical tipping point predicting whether individuals were flourishing or languishing in life. This tipping point, called the *positivity ratio*, was calculated as the proportion of one's experienced positive and negative emotions. Individuals who were *flourishing* (or "living the good life") reported a positivity ratio greater than 2.9, while *languishing* individuals (those who felt "stuck in a rut" or lived a stagnant life) reported scores at or below 2.9. Further, those who reported a ratio below 1.0 were likely to suffer from clinically significant levels of depressive symptoms, and thus classified as *depressed*. Recent studies have examined the utility of the positivity ratio, and findings supported the concept of the tipping points as they related to a number of health indicators such as job performance, marital satisfaction, coping strategies, and depressive symptoms. The present study examined a sample of postdoctoral research fellows (n = 200) to determine if the three classifications of positivity (viz., flourishing, languishing, and depressed) significantly distinguished differences in reported stress, trait anxiety, and depressive symptoms. Using MANOVA, results provided further support for the utility and generalizability of the positivity ratio, as the data revealed significant differences in the reported levels of stress, trait anxiety, and depressive symptoms among the

flourishing, languishing, and depressed groups of postdocs. Flourishing postdocs demonstrated the lowest mean scores of stress, trait anxiety, and depressive symptoms, while depressed postdocs recorded the highest scores.

Keywords: postdoc, positivity, emotions, stress, anxiety, depression

INTRODUCTION

According to the broaden-and-build theory of positive emotions, positive emotions have the ability to enhance one's health and quality of life (Fredrickson, 2001, 2004, 2005). Individuals who experience higher frequencies of positive emotions—such as love, gratitude, contentment, and joy—are generally more adaptive to stressful situations (Gloria et al., 2012; Tugade & Fredrickson, 2004), demonstrate greater resilience (Cohn et al., 2009), have reduced risks of morbidity and mortality (Danner, Snowdon, & Friesen, 2001; Fredrickson & Levenson, 1998), and are more likely to flourish in life (Fredrickson, 2006; Fredrickson & Losada, 2005). In contrast, those who experience fewer positive emotions and more negative emotions—such as fear, anger, sadness, and shame—tend to be less satisfied with life, are more likely to develop physical as well as psychological illnesses (Gallo & Matthews, 2003; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002), and have increased absenteeism and reduced productivity at the workplace (Penney & Spector, 2005).

Researchers have also discovered that the proportion of one's experienced positive and negative emotions—referred to as *positivity ratio*—has a predictive ability in distinguishing between individuals who flourished or languished in life. Fredrickson and

Losada (2005) found that a positivity ratio of 2.9 served as a reliable cutoff score or a tipping point between flourishing and languishing individuals. Those who reported positivity ratios greater than 2.9 were classified as *flourishing* because they were satisfied with life, had a sense of fulfillment, were able to bounce back effectively from stressful situations, and felt as though things in their lives were going as or better than expected; in other words, having a positivity ratio above 2.9 was considered "the good life" (Fredrickson, 2009b). However, those who reported experiencing positivity ratios at or below 2.9 were considered to be *languishing* in life. These individuals described life as unsatisfactory, unfulfilled, or stagnating; they were burdened by feelings of being "stuck in a rut" or that "the grass was greener on the other side." Moreover, individuals who reported a positivity ratio less than 1.0—in which negative emotions were experienced more frequently than positive emotions—had a sense of being overwhelmed by difficult life conditions and described life as a struggle "to keep their heads above water." These persons with a positivity ratio lower than 1.0 were classified as *depressed*, given that individuals with clinically significant levels of depressive symptoms typically had scores within this range (Fredrickson, 2009a; Schwartz et al., 2002).

A growing number of studies continue to confirm the utility of the positivity ratio in identifying individuals who flourish, languish, or are depressed. The ratio was not only limited to individuals, but was also found to be useful in measuring interpersonal or organizational well-being (Fincham & Beach, 2010; Fredrickson, 2009b). Researchers found that long-lasting healthy marriages might require even a higher positivity ratio of at least 5.0, whereas flourishing organizations seemed to have a similar tipping point as

individuals—a ratio of at least 3.0 (Fredrickson, 2009b). Further, the concept of the positivity ratio has been tested through a variety of studies using an array of settings and samplings. For instance, researchers have examined the utility of the ratio with samples of college students (Fredrickson, 2006), employees (Rego, Sousa, Marques, & Cunha, 2011), public school teachers, and military spouses (Faulk, Gloria, & Steinhardt, 2012; Faulk, Gloria, Steinhardt, et al., 2012). These studies all found that the classifications of positivity indeed significantly revealed differences in how individuals adapted to and bounced back from stressful situations, as well as differences in reported health and well-being.

However, to our knowledge, no studies to date have examined the applicability of the positivity ratio toward postdoctoral research fellows (postdocs). Postdocs, ironically, are an overlooked and understudied population. It has been reported that the work and life conditions of postdocs are inundated by constant exposures to high levels of stress (Smaglik, 2006; Small, 2012). Often characterized as neither a faculty nor a student, postdocs tend to fall in the cracks and consequently receive neither the recognition nor the benefits that they feel is deserved (e.g., control over their work/funding, and health insurance for self and family) (Aschwanden, 2006; Smaglik, 2006). They also often report having feelings of fear, uncertainty, pressure, and lack of security due to the impermanence of their employment, high work expectations, as well as the extreme competitiveness of the job market (i.e., low supply, high demand for ideal jobs such as tenure-track professors/researchers) (Davis, 2009; K. Kaplan, 2012; Woolston, 2002). Considering these points, is it not surprising that postdocs describe their work and life as

extremely stressful, and often filled with feelings of anxiety and depression. However, despite these grim reports, positive emotions might have the potential to help postdocs deal with their stressors as demonstrated by the aforementioned research.

Therefore, the purpose of the present study was to examine if the positivity ratio criteria would significantly differentiate levels of stress, trait anxiety, and depressive symptoms among postdocs, with respect to their positivity classifications as flourishing, languishing, or depressed. It is hypothesized that (a) flourishing individuals will report the lowest levels of stress, trait anxiety, and depressive symptoms; (b) depressed individuals will report the highest levels of stress, trait anxiety, and depressive symptoms; and (c) languishing individuals will report scores in between the flourishing and depressed groups.

METHODS

Participants and Procedures

Participants were recruited from a pool of postdocs who were employed at a large research institution in Texas during February 2012. The email addresses of potential participants (n = 523) were obtained from the institution's human resources office, and recruitment letters were sent via email inviting postdocs to voluntarily participate in a Qualtrics online survey that required approximately 30 minutes to complete. The sample selection method did not have exclusion criteria, except that participants must be currently employed under a postdoctoral fellowship appointment during the time of data collection.

In order to enhance the survey response rate, a variety of incentive prizes were offered (Deutskens et al., 2004). Each participant was compensated with a $5 Starbucks gift card, a deck of inspirational quote cards ($2 value), and an *Individual Feedback Profile* document which provided a confidential report of the participant's results as well as an anonymous summary of the sample's aggregate results. In addition, participants were entered into a lottery drawing for a number of larger prizes (e.g., restaurant gift cards valued from $10 to $50, iPod Shuffles, and Amazon Touch Kindles); one prize was awarded for every 15 surveys completed. The present study was approved by the Institutional Review Board.

Measures

The online survey assessed participants' demographic characteristics, positivity, stress, trait anxiety, and depressive symptoms. Each of these variables is further discussed in the following sections, and a copy of the survey may be requested from the corresponding author.

Demographics

Participants were asked to report a variety of personal characteristics including age, sex, race/ethnicity, marital status, number of children, college/school (i.e., location of employment), employment length, and nationality (i.e., country of origin).

Positivity

The value of positivity represents the ratio of one's experienced positive emotions over negative emotions (Fredrickson & Losada, 2005), and these emotions were measured by the 20-item Modified Differential Emotions Scale (mDES; Fredrickson, 2009a; Fredrickson et al., 2003). Ten of the scale's items assessed the participants' positive emotions (e.g., amused, hopeful, inspired, and proud) while the remaining 10 items examined negative emotions (e.g., angry, distrust, fearful, and overwhelmed).

On a five-point scale ranging from 0 to 4 (*never* to *most of the time*), respondents indicated to what extent they experienced various feelings and emotions over the past two weeks. For instance, a sample positive emotion item stated, "In the past two weeks, I have felt grateful, appreciative, or thankful." A sample negative emotion item stated, "In the past two weeks, I have felt sad, downhearted, or unhappy." Positive emotion items rated at least a score of 2 (*some of the time*) and negative emotion items rated at least a score of 1 (*hardly*) were tallied according to these asymmetric criteria in order to account for *positivity offset* and *negativity bias* (Fredrickson & Losada, 2005). Positivity offset represents the notion that most people usually feel at least mild levels of positive emotions throughout their day-to-day activities (Cacioppo, Gardner, & Berntson, 1999); on the other hand, negativity bias represents the idea that negative events have more weight and thus have stronger impacts than positive events (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Cacioppo et al., 1999).

The positivity score, ranging from 0 to 10 points, was calculated by dividing the sum of the tallied positive emotion items with the sum of the tallied negative emotion

items; if the sum of the negative emotion items was "0," it will be recoded to "1" to prevent errors related to division by zero (Fredrickson, 2009a). Postdocs with positivity ratios greater than 2.9 were classified as *flourishing* individuals; those with ratios from 1.0 to 2.9 were considered *languishing*; and individuals with ratios below 1.0 are *depressed*. According to previous research, the internal reliability of the positive emotions subscale of the mDES was $\alpha = .78$, while the negative emotions subscale had a coefficient of $\alpha = .69$ (Fredrickson et al., 2003); the present study recorded greater reliability scores on both the positive ($\alpha = .87$) and negative emotions subscales ($\alpha = .88$).

Stress

This variable was assessed using the 10-item Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988), which measured the appraised stressfulness of the respondent's life situations. The scale items asked participants to rate how often stressful events occurred during the past month on a five-point scale from 0 (*never*) to 4 (*very often*). Sample items include "How often have you been upset because of something that happened unexpectedly?," "How often have you felt that you were unable to control the important things in your life?," and "How often have you felt difficulties were piling up so high that you could not overcome them?" The stress score was calculated as the sum of the 10 items, ranging from 0 to 40, with higher scores representing higher levels of stress. Previous research found the internal reliability of the PSS-10 to range from acceptable ($\alpha = .78$) to excellent ($\alpha = .91$; Cohen & Janicki-Deverts, 2012), and the reliability from the present study was estimated at $\alpha = .86$.

Trait Anxiety

The 20-item trait anxiety subscale of the State-Trait Anxiety Inventory for Adults (STAI; Spielberger et al., 1968, 1977) was used to measure the participants' tendency to appraise stressful events as threatening and thus respond with heightened levels of state anxiety reactions (Spielberger et al., 1983). Using a four-point scale ranging from 1 (*almost never*) to 4 (*almost always*), participants responded to items including, "I feel nervous and restless," "I feel like a failure," and "I get in a state of tension or turmoil as I think over my recent concerns and interests." Scores for this variable were calculated as the sum of the 20 items; scores ranged from 20 to 80, with higher scores representing higher levels of trait anxiety. Researchers cautioned that having a trait anxiety score of 43 or higher could signify the presence of an anxiety disorder (Van Dam et al., 2011). The trait anxiety subscale demonstrated very good to excellent internal reliability, with Cronbach's alphas ranging from .89 to .91 (Spielberger et al., 1983); the present study estimated recorded an excellent reliability score at $\alpha = .91$.

Depressive Symptoms

The Center for Epidemiologic Studies Depression (CES-D) scale was used to assess the participants' level of experienced depressive symptoms (Radloff, 1977). Consisting of 20 items, the instrument assessed how often respondents felt a variety of depressive symptoms during the previous week. Using a four-point scale ranging from 0 (*rarely or none of the time; less than 1 day*) to 3 (*most or all of the time; 5-7 days*), participants responded to statements such as "I was bothered by things that usually don't

bother me," "I did not feel like eating; my appetite was poor," and "I had trouble keeping my mind on what I was doing." The CES-D score was calculated as the sum of the 20 items, ranging from 0 to 60, with higher scores representing higher levels of experienced depressive symptoms. A score of 16 or greater is considered a moderately severe level of symptoms and could be a marker for clinical depression (Radloff, 1977). Previous research found the internal consistency of the scale ranged from good to excellent (α = .85-.90; Radloff, 1977), and the present study also demonstrated very good reliability at α = .86.

Data Analyses

All analyses were completed using the Statistical Package for the Social Sciences (SPSS) software version 21, and mean substitution was used to replace missing data.

Descriptive Statistics and Correlations

Means, standard deviations, and bivariate correlations of all study variables were calculated using descriptive statistics, Pearson correlations for continuous variables, point-biserial correlations for continuous and dichotomous variables, and chi-square tests for pairs of dichotomous variables.

Multivariate Analysis of Variance

A one-way between-groups multivariate analysis of variance (MANOVA) was performed to examine differences in reported stress, trait anxiety, and depressive symptoms among the varying levels of positivity. The independent variable, positivity,

was classified into three groups (viz., flourishing, languishing, and depressed) according to the criteria scores determined by Fredrickson and Losada (2005). Using the procedures detailed by Pallant (2010), preliminary examinations of statistical assumptions were conducted to evaluate normality, univariate and multivariate outliers, linearity, homogeneity of regression, multicollinearity and singularity, and homogeneity of variance-covariance matrices. Post-hoc pairwise comparisons were performed using Tukey's Honestly Significant Difference (HSD) method; in the instance that equal variances were not assumed, the Games-Howell test was instead used. Cohen's *d* was calculated to estimate the effect size of group differences.

RESULTS

Descriptive Analysis

Data collection was conducted over a period of two weeks and the study obtained a final sample size of $n = 200$ postdocs (38% response rate). This response rate exceeded expectations as previous studies with similar methods recorded lower return rates ranging from 17% to 25% (Deutskens et al., 2004; Evans & Mathur, 2005; Sax et al., 2003); a meta-analysis of 56 web-based surveys from 39 studies reported an average response rate of 35% (Cook et al., 2000).

Participants were primarily male (59.5%) with a mean age of 32 years, ranging from 26 to 52 years. In terms of race/ethnicity, 63.5% were non-Hispanic White or Caucasian, 18% Asian or Pacific Islander, 8.5% Hispanic or Latino, 7% Indian or South Asian, 0.5% Black or African American, and 2.5% other. The majority were married

(59.5%), 31% were single, 7% were living with a partner, and the remaining 2.5% were either divorced or separated. Their family sizes ranged from having zero to four children; 71% had no children, 18.5% had one, 6% had two, 4% had three, and one participant had four children. The participants were employed as postdocs for an average of 1.5 years, and ranged from 1 year to 6 years and 8 months. The majority worked in the college of natural sciences (48.5%), 20% in engineering, 7.5% in liberal arts, 5.5% in geosciences, 5% in pharmacy, and the remaining were in communication, education, public affairs, social work, or other. Most of the postdocs originated from the United States (US) (50.5%), 10.5% China, 6.5% India, 4% South Korea, 3.5% United Kingdom, 3% Canada, and the remaining were from 25 other countries around the globe.

Prior to correlation analyses, multiple-category demographic variables were collapsed into binary variables to produce appropriately sized groups: marital status (1 = *married,* 0 = *unmarried*), college/school (1 = *natural sciences,* 0 = *other*), race/ethnicity (1 = *non-Hispanic White/Caucasian,* 0 = *other*), and nationality (1 = *from US,* 0 = *other*). Age, number of children, and employment length were retained as continuous variables. Table 13 displays the means, standard deviations, and correlations for all study variables. The analysis indicated strong correlations between stress and trait anxiety ($r = .76$, $p < .001$), stress and depressive symptoms ($r = .72$, $p < .001$), as well as trait anxiety and depressive symptoms ($r = .75$, $p < .001$). Among the demographic control variables, no significant associations were found with any of the focal dependent variables except for marital status. Results showed that, on average, married postdocs experienced fewer depressive symptoms than those who were unmarried ($r = -.19$, $p < .01$).

Table 13. Means, standard deviations (SD), and bivariate correlations for all variables (n = 200).

Variable	Mean	SD	S	TA	DS	A	NC	EL	F	M	NS	W	US
Stress (S)	16.21	5.76	--										
Trait Anxiety (TA)	39.66	9.09	.76***	--									
Depressive Symptoms (DS)	10.53	7.54	.72***	.75***	--								
Control													
Age (A) [a]	32.06	3.71	-.03	-.04	.00	--							
Number of Children (NC)	.45	.82	-.02	-.11	-.13	.45***	--						
Employment Length (EL)	1.50	1.23	.05	.09	.04	.26***	.15*	--					
Female (F) [†]	--	--	.02	-.03	-.07	-.03	-.00	-.16*	--				
Married (M) [†]	--	--	-.05	-.13	-.19**	.13	.43***	.15*	.04	--			
Natural Sciences (NS) [b†]	--	--	-.11	-.06	-.10	.01	.06	.21**	-.01	.11	--		
White (W) [†]	--	--	-.08	-.09	.01	.03	.10	.02	.08	-.08	-.03	--	
US American (US) [†]	--	--	-.03	-.03	.05	-.01	.03	.02	.19**	-.03	.04	.49***	--

[a] n = 197; [b] n = 199

[†] Sex (Female = 1, Male = 0); Marital Status (Married = 1, Unmarried = 0); College/School (Natural Sciences = 1, Other = 0); Race/Ethnicity (White = 1, Other = 0); Nationality (US = 1, Other = 0).

*p < .05, **p < .01, ***p < .001

Multivariate Analysis of Variance

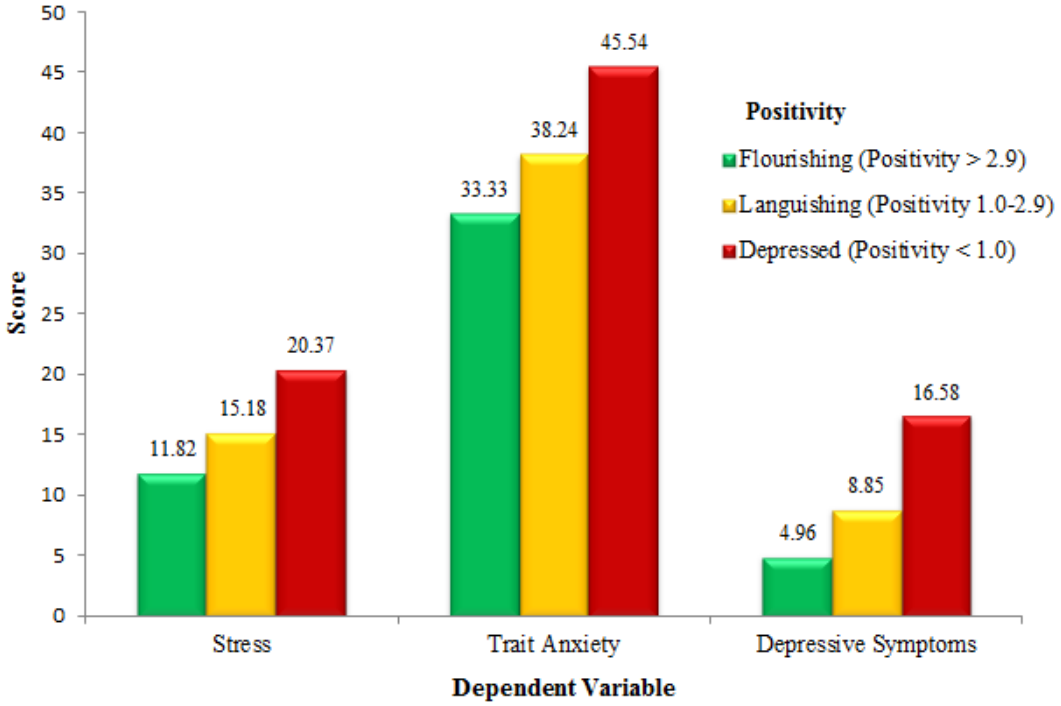
Three data points related to positive emotions and one from depressive symptoms were missing; these were replaced via mean substitution. Preliminary tests of statistical assumptions found no serious violations, except for the equality of variances in depressive symptoms; according to Levene's Test of Equality of Error Variances, the variable depressive symptoms did not satisfy the assumption of equality of variances ($p <$ .01), and thus the Games-Howell test was used for post-hoc comparisons in depressive symptoms instead of Tukey's HSD.

Results found a significant difference among the flourishing, languishing, and depressed groups on the combined dependent variables, $F_{6, 390} = 13.61$, $p < .001$; Wilks' Lambda = .68; $\eta_p^2 = .17$. When the results for the dependent variables were individually examined using the tests of between-subjects effects, significant differences were found for all dependent variables: stress ($p < .001$, $\eta_p^2 = .25$), trait anxiety ($p < .001$, $\eta_p^2 = .20$), and depressive symptoms ($p < .001$, $\eta_p^2 = .29$).

As shown in Figure 10, the flourishing group reported the lowest levels of stress, trait anxiety, and depressive symptoms. In contrast, the depressed group recorded the highest levels of stress, trait anxiety, and depressive symptoms. And as expected, the languishing group had scores that were between the flourishing and depressed groups across all three of the dependent variables. All pairwise comparisons between the categories of positivity (viz., flourishing vs. languishing, flourishing vs. depressed, and

languishing vs. depressed) yielded statistically significant differences in the mean scores of stress, trait anxiety, and depressive symptoms (see Table 14).

Figure 10. Means, standard deviations, and ranges of stress, trait anxiety, and depressive symptoms as reported by flourishing, languishing, and depressed postdocs (n = 200).



Dependent Variable	Flourishing (n = 27)	Languishing (n = 116)	Depressed (n = 57)	F (2, 197)
Stress (range 0 - 40)	11.82 ± 5.02	15.18 ± 5.03	20.37 ± 5.03	32.28***
Trait Anxiety (range 20 - 80)	33.33 ± 7.23	38.24 ± 8.20	45.54 ± 8.49	24.64***
Depressive Symptoms (range 0 - 60)	4.96 ± 4.32	8.85 ± 5.76	16.58 ± 8.18	39.80***

Note: Higher scores indicate higher levels of stress, trait anxiety, or depressive symptoms. The cut-off scores for possible cases of anxiety disorder and clinical depression are 43 and 16, respectively.

***$p < .001$

Table 14. Pairwise comparisons for each dependent variable by positivity category.

Dependent Variable	Comparison of Positivity Categories	Mean Difference (Standard Error)		Cohen's *d*
Stress	Flourishing vs. Languishing	-3.37**	(1.07)	-.67
	Flourishing vs. Depressed	-8.55***	(1.17)	-1.70
	Languishing vs. Depressed	-5.19***	(.81)	-1.03
Trait Anxiety	Flourishing vs. Languishing	-4.91*	(1.75)	-.60
	Flourishing vs. Depressed	-12.21***	(1.91)	-1.49
	Languishing vs. Depressed	-7.30***	(1.32)	-.89
Depressive Symptoms	Flourishing vs. Languishing	-3.88**	(.99)	-.61
	Flourishing vs. Depressed	-11.62***	(1.37)	-1.81
	Languishing vs. Depressed	-7.73***	(1.21)	-1.20

Note: Tukey's HSD was used for stress and trait anxiety. Games-Howell's test was used for depressive symptoms because equal variances were not assumed.

*$p < .05$, **$p < .01$, ***$p < .001$

DISCUSSION

Using a sample of *n* = 200 postdocs, the purpose of the present study was to examine if groups of flourishing, languishing, and depressed postdocs would significantly differ from each other in scores of stress, trait anxiety, and depressive symptoms. As hypothesized, flourishing postdocs (positivity ratio > 2.9) reported the lowest levels of stress, trait anxiety, and depressive symptoms; the languishing group (positivity ratio = 1.0 to 2.9) reported higher levels than the flourishing group; but the depressed postdocs (positivity ratio < 1.0) exhibited the highest levels of stress, trait anxiety, and depressive symptoms.

These results lend further support for the utility of the positivity criteria as proposed by Fredrickson and Losada (2005). Post hoc comparisons yielded significant differences between all possible pairs within each dependent variable, indicating that the positivity tipping points effectively distinguished differences among flourishing, languishing, and depressed postdocs. The data showed that 13% of the postdocs were flourishing, 58% were languishing, and 29% were depressed. According to researchers, approximately 17 to 20% of the general population fit the criteria for flourishing (Fredrickson & Losada, 2005; Keyes, 2002, 2007), while about 80% scored below the flourishing point (Fredrickson, 2009a).

As expected, depressed postdocs not only experienced the highest levels of stress, trait anxiety, and depressive symptoms, but they also reported average levels that were above the cutoff scores for possible cases of anxiety disorders (Van Dam et al., 2011) and clinically significant levels of depressive symptoms (Antoni et al., 2001; Myers &

Weissman, 1980; Radloff, 1977; Schulberg et al., 1985). Out of the total sample, 35% of the postdocs reported scores at or above the trait anxiety cutoff score of 43, signifying that at least 1 out of 3 postdocs falls within the range for probable cases of clinical anxiety disorder; in comparison to a large community study with 6,685 participants, only 11.5% of the sample fell above the cutoff score (Van Dam et al., 2011). In terms of depressive symptoms, 21% had scores that were at or above the cutoff point of 16, indicating a moderately severe level of symptoms and a possible marker for clinical depression; this proportion aligns with the 21% in the general population who also report depressive symptoms score above the cutoff value (Radloff, 1977).

Such striking statistics should raise concerns regarding the health and well-being of postdocs. Employers should provide programs, opportunities, and resources that would increase postdoc positivity, as well as decrease their stress levels, trait anxiety, and depressive symptoms. Improving the positivity and well-being of postdocs is not only in their self-interest, but also in the best interest of the organization, considering that happier and healthier employees are more engaged and more productive workers.

Results from the present study should be considered in light of the following limitations. The present study used cross-sectional data, and thus causality and directionality cannot be determined from the found associations among the variables. It is also possible that the data may be vulnerable to inaccuracies due to common-methods bias and the self-report nature of the survey instrument. The participants were recruited from a pool of postdocs who were employed at a large research institution in the state of Texas during the spring of 2012. There were no exclusion criteria, and all postdocs from

any college or department across the university were allowed to participate. Due to this localized sampling, results and implications may not be applicable to postdocs from other institutions, locations, or time periods.

In conclusion, findings from the present study provide further support for the mathematically derived positivity ratio cutoff scores developed by Fredrickson and Losada (Fredrickson & Losada, 2005). As expected, flourishing postdocs recorded the lowest scores, while depressed postdocs reported the highest levels of stress, trait anxiety, and depressive symptoms. Although most of the participants' health indicators scored relatively close to the scores of the general population, particular attention should be paid toward addressing anxiety issues among postdocs, given that 35% of postdocs—three times the rate from the general population—reported trait anxiety scores about the cutoff for probably clinical levels of anxiety disorder. Programs should be implemented to increase positive emotions and decrease negative emotions in the day-to-day work and lives of postdocs. Future research should investigate possible explanations behind why postdocs experience such high rates of anxiety.

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Chapter 6: Study III - Determinants of Work Engagement among Postdoctoral Fellows: The Impacts of Work Meaningfulness, Supervisor Support, Stress, and Positive Emotions

ABSTRACT

In the recent years, employers and researchers have been highly interested in studying the determinants of employee work engagement because of its strong relationship with individual productivity and overall organizational success. Considered the antipode of the burnout syndrome—which is characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment—work engagement is instead embodied by vigor, dedication, and absorption. Previous research has identified work meaningfulness and supervisor support as the strongest predictors of work engagement, but little is known about the additional influences of stress and positive emotions on work engagement. Therefore, using a sample of 200 postdoctoral research fellows, the present study was conducted to determine if stress and positive emotions had influences on work engagement, over and above the contributions of work meaningfulness, supervisor support, and a variety of demographic controls. Hierarchical multiple regression was used in the data analysis, and results confirmed the significant associations of stress and positive emotions with work engagement among postdocs. Additional mediation analysis revealed that positive emotions completely mediated the link between supervisor support and work engagement. In light of these findings, to optimize engagement and productivity at the workplace, supervisors should strive to assign meaningful work to

their staff and implement programs that would help employees find meaning in their work. Additionally, it is important for supervisors to be supportive of their staff and to create positive interpersonal relationships and workplace environments.

Keywords: engagement, positive emotions, stress, meaningfulness, postdoc, supervisor

INTRODUCTION

Interest in understanding the determinants of employee work engagement has been growing as employers realize its strong relationship with employee productivity and the greater organizational success (Freeney & Tiernan, 2006; Kahn, 1990; Simpson, 2009). Researchers propose that work engagement is characterized by three dimensions; they are vigor, dedication, and absorption. Vigor is described as the individual's level of energy toward work, and their willingness to invest time and effort in their work despite challenging conditions; dedication is characterized by the individual's degree of involvement, ownership, and pride over their work; and lastly, absorption refers to the extent of how engrossed an employee feels about their work, to the point where time seems to flow more quickly than expected (Bakker & Demerouti, 2008; Bakker et al., 2008; Schaufeli et al., 2006).

Researchers consider work engagement to be the antipode of the burnout syndrome, which is characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment (González-Romá et al., 2006; Schaufeli et al., 2006). Emotional exhaustion is characterized by feelings of fatigue or being drained of

emotional and physical resources; depersonalization refers to one's cynical and negative tendencies toward others; and reduced personal accomplishment is defined as self-perceptions of incompetence or lack of achievement (Maslach & Leiter, 2008; Maslach et al., 2001). Not only is burnout related to employee absenteeism and loss of productivity (Borritz et al., 2006; Nayeri et al., 2009), all of its three dimensions were also found to be associated with chronic stress and depressive symptoms (Steinhardt et al., 2011). Additionally, in our previous work (2012), burnout was found to be strongly and negatively associated with positive emotions.

The strongest predictors of work engagement are work meaningfulness (r = .63) and supervisor support (r = .66; May et al., 2004; Renn & Vandenberg, 1995). Work meaningfulness refers to the perceived value of work goal or purpose as it relates to an employee's personal ideals and beliefs. The absence of work meaning would leave employees feeling alienated and disengaged from their work (Aktouf, 1992). Supervisor support, on the other hand, is characterized by the amount and quality of support, encouragement, and respect that employees receive from their supervisors. Employees with supportive supervisors felt safer and more secure at the workplace, and thus they were more engaged with their work (May et al., 2004).

Given the bipolar properties of work engagement and burnout, and considering the aforementioned associations of stress and positive emotions toward burnout, it is expected that stress would have a negative relationship with work engagement while positive emotions would be positively associated with work engagement. Although studies linking stress with burnout are in abundance (Iacovides et al., 2003; Jamal &

Baba, 2000; McManus et al., 2004; Steinhardt et al., 2011), there seems to be a absence in research directly relating stress to work engagement. Furthermore, researchers have suggested that positive emotions may be related to engagement as a simple correlation (Bakker & Demerouti, 2008) or as a mediating construct between resources and engagement (Schaufeli, Bakker, et al., 2009); however, how positive emotions relate to work engagement in tandem with work meaningfulness and supervisor support has not been examined.

Therefore, the purpose of the present study was to (a) investigate if stress and positive emotions would significantly account for variance in work engagement, over and above what has been explained by known predictors (viz., work meaningfulness and supervisor support) as well as a variety of demographic covariates; (b) examine how much variance in work engagement can be explained altogether by work meaningfulness, supervisor support, stress, and positive emotions; (c) determine how much unique variance is explained by each independent variable; and (d) compare the strengths of the independent variables and identify the strongest predictors of work engagement among postdoctoral research fellows (postdocs).

METHODS

Participants and Procedures

Participants were recruited from a pool of postdocs who were employed at a large research institution in Texas during February 2012. The email addresses of potential participants (n = 523) were obtained from the institution's human resources office, and

recruitment letters were sent via email inviting postdocs to voluntarily participate in a Qualtrics online survey that required approximately 30 minutes to complete. The sample selection method did not have exclusion criteria, except that participants must be currently employed under a postdoctoral fellowship appointment during the time of data collection.

In order to enhance the survey response rate, a variety of incentive prizes were offered (Deutskens et al., 2004). Each participant was compensated with a $5 Starbucks gift card, a deck of inspirational quote cards ($2 value), and an *Individual Feedback Profile* document which provided a confidential report of the participant's results as well as an anonymous summary of the sample's aggregate results. In addition, participants were entered into a lottery drawing for a number of larger prizes (e.g., restaurant gift cards valued from $10 to $50, iPod Shuffles, and Amazon Touch Kindles); one prize was awarded for every 15 surveys completed. The present study was approved by the Institutional Review Board.

Measures

The online survey assessed participants' demographic characteristics, work engagement, work meaningfulness, supervisor support, stress, and positive emotions. Each of these variables is further discussed in the following sections, and a copy of the survey may be requested from the corresponding author.

Demographics

Participants were asked to report a variety of personal characteristics including age, sex, race/ethnicity, marital status, number of children, college/school (i.e., location of employment), employment length, and nationality (i.e., country of origin). Because these demographic characteristics may be related to the dependent variables, the present study used them as covariates in the regression analyses.

Work Engagement

Participant work engagement was assessed using the nine-item Utrecht Work Engagement Scale (UWES-9; Schaufeli et al., 2006). On a seven-point scale ranging from 0 (*never*) to 6 (*always; everyday*), respondents indicated the extent to which they agreed with statements that evaluated their feelings about their job (e.g., "At my work, I feel bursting with energy," "I am enthusiastic about my job," and "I feel happy when I am working intensely"). The work engagement score was calculated as the mean of the nine items, ranging from 0 to 6, with higher scores indicating higher levels of work engagement. According to previous research, this scale demonstrated good to excellent internal reliability with Cronbach's alphas ranging from .85 to .92 (Schaufeli et al., 2006); the present study also recorded excellent reliability at $\alpha = .92$.

Work Meaningfulness

Work meaningfulness was measured using the six items developed by May, Gilson, and Harter (2004). Participants were asked to report the extent to which they

agreed with statements that examined the degree of meaning that they felt about their work-related activities. Using a five-point agreement-disagreement Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), participants responded to statements such as "The work I do on this job is very important to me," "My job activities are personally meaningful to me," and "I feel that the work I do on my job is valuable." The work meaningfulness score was calculated as the mean of the six items, ranging from 1 to 5, with higher scores indicating higher levels of work meaningfulness. This scale had excellent reliability with a Cronbach's alpha of .90 (May et al., 2004), and the present study obtained an alpha of .94.

Supervisor Support

The participants' sense of supervisor support was assessed using the 10-item scale from May et al. (2004). Using a five-point agreement-disagreement Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), participants responded to statements including "My supervisor helps me solve work-related problems," "My supervisor encourages me to develop new skills," and "My supervisor praises good work." The supervisor support score was calculated as the mean of the 10 items, ranging from 1 to 5, with higher scores indicating higher levels of supervisor support. This scale reported excellent internal reliability with a Cronbach's alpha of .95 (May et al., 2004), and the present study also recorded an excellent reliability at $\alpha = .94$.

Stress

This variable was assessed using the 10-item Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988), which measured the appraised stressfulness of the respondents' life situations. The scale items asked participants to rate how often stressful events occurred during the past month on a five-point scale from 0 (*never*) to 4 (*very often*). Sample items include "How often have you been upset because of something that happened unexpectedly?," "How often have you felt that you were unable to control the important things in your life?," and "How often have you felt difficulties were piling up so high that you could not overcome them?" The stress score was calculated as the sum of the 10 items, ranging from 0 to 40, with higher scores representing higher levels of stress. Previous research found the internal reliability of the PSS-10 to range from acceptable (α = .78) to excellent (α = .91; Cohen & Janicki-Deverts, 2012), and the reliability from the present study was estimated at α = .86.

Positive Emotions

The participants' experienced positive emotions were measured by the 10-item positive emotions subscale of the Modified Differential Emotions Scale (mDES; Fredrickson et al., 2003). Each item asked participants to recall how often they have experienced particular sets of positive emotions during the previous two weeks (e.g., "In the past two weeks, I have felt amused, fun-loving, or silly."), and response options ranged on a five-point scale from 0 (*never*) to 4 (*most of the time*). The positive emotions score was calculated as the sum of the 10 items; scores ranged from 0 to 40, with higher

scores indicating higher frequencies of experienced positive emotions. Internal reliability for the positive emotion subscale was found to be acceptable in previous research (α = .79; Fredrickson et al., 2003), and reliability was very good in the present study (α = .87).

Data Analyses

All analyses were completed using the Statistical Package for the Social Sciences (SPSS) software version 21, and mean substitution was used to replace missing data. Using the procedures detailed by Pallant (2010), preliminary tests were performed to ensure that the statistical assumptions of normality, linearity, multicollineary, and homoscedasticity were satisfied before the regression analysis was conducted.

Descriptive Statistics and Correlations

Means, standard deviations, and bivariate correlations of all study variables were calculated using descriptive statistics, Pearson correlations for continuous variables, point-biserial correlations for continuous and dichotomous variables, and chi-square tests for pairs of dichotomous variables.

Hierarchical Multiple Regression

Hierarchical multiple regression analysis was used to examine how well the independent variables (viz., work meaningfulness, supervisor support, stress, and positive emotions) explained the variance in the dependent variable—work engagement—after controlling for the variance associated with demographic covariates. The hierarchical model of the multiple regression analysis consisted of four steps. In Step 1, the

demographic covariates were entered in the regression of work engagement. In Steps 2 through 4, the following independent variables were entered in sequential order: work meaningfulness and supervisor support (Step 2), stress (Step 3), and positive emotions (Step 4).

RESULTS

Descriptive Analysis

Data collection was conducted over a period of two weeks and the study obtained a sample size of n = 200 postdocs (38% response rate). This response rate exceeded expectations as previous studies with similar methods have recorded lower return rates ranging from 17% to 25% (Deutskens et al., 2004; Evans & Mathur, 2005; Sax et al., 2003); a meta-analysis of 56 web-based surveys from 39 studies reported an average response rate of 35% (Cook et al., 2000). However, due to partially missing demographic data (viz., age and college/school), four of the participants were dropped from the analysis, resulting in a final sample size of n = 196; three missing data points related to positive emotions were replaced via mean substitution.

The study participants were primarily male (59.5%) with a mean age of 32 years, ranging from 26 to 52 years. Demographically, 63.5% were non-Hispanic White or Caucasian, 18% Asian or Pacific Islander, 8.5% Hispanic or Latino, 7% Indian or South Asian, 0.5% Black or African American, and 2.5% other. The majority were married (59.5%), 31% were single, 7% were living with a partner, and the remaining 2.5% were either divorced or separated. Their family sizes ranged from having zero to four children;

71% had no children, 18.5% had one, 6% had two, 4% had three, and one participant had four children. The participants were employed as postdocs for an average of 1.5 years, and ranged from 1 year to 6 years and 8 months. The majority worked in the college of natural sciences (48.5%), 20% in engineering, 7.5% in liberal arts, 5.5% in geosciences, 5% in pharmacy, and the remaining were in communication, education, public affairs, social work, or other. Most of the postdocs originated from the United States (US) (50.5%), 10.5% China, 6.5% India, 4% South Korea, 3.5% United Kingdom, 3% Canada, and the remaining were from 25 other countries around the globe.

Prior to the regression analyses, multiple-category demographic variables were collapsed into binary variables in order to produce appropriately sized groups: marital status (1 = *married,* 0 = *unmarried*), college/school (1 = *natural sciences,* 0 = *other*), race/ethnicity (1 = *non-Hispanic White/Caucasian,* 0 = *other*), and nationality (1 = *from US,* 0 = *not from US*). Age, number of children, and employment length were retained as continuous variables.

Table 15 displays the means, standard deviations, and correlations for all study variables. Work meaningfulness, supervisor support, stress, positive emotions, and work engagement were all moderately to strongly correlated with each other. The strongest correlations with work engagement were from work meaningfulness ($r = .74$, $p < .001$) and positive emotions ($r = .59$, $p < .001$). Among the demographic control variables, age was positively related to work meaningfulness, number of children was positively correlated with work meaningfulness, supervisor support, and work engagement.

Table 15. Means, standard deviations (SD), and bivariate correlations for all variables (n = 196).

Variable	Mean	SD	WM	SS	S	PE	WE	A	NC	EL	F	M	NS	W	US
Work Meaningfulness (WM)	4.18	.63	--												
Supervisor Support (SS)	3.84	.84	.41***	--											
Stress (S)	16.18	5.79	-.31***	-.36***	--										
Positive Emotions (PE)	24.23	6.02	.54***	.47***	-.47***	--									
Work Engagement (WE)	4.38	.93	.74***	.44***	-.40***	.59***	--								
Control															
Age (A)	32.08	3.71	.15*	.08	-.04	.08	.11	--							
Number of Children (NC)	.44	.82	.17*	.17*	-.00	.09	.16*	.46***	--						
Employment Length (EL)	1.49	1.23	-.01	-.05	.04	-.13	-.02	.26***	.16*	--					
Female (F)†	--	--	-.12	-.08	.01	.02	-.05	-.04	.01	-.17*	--				
Married (M)†	--	--	.05	.03	-.06	.01	.07	.14	.43***	.15*	.04	--			
Natural Sciences (NS)†	--	--	-.05	-.03	-.11	.01	-.05	.01	.05	.21**	-.00	.12	--		
White (W)†	--	--	-.01	-.07	-.07	.05	-.01	.03	.08	.02	.09	-.07	-.05	--	
US American (US)†	--	--	-.07	-.01	-.02	-.02	-.07	.00	.01	.02	.21**	-.03	.02	.48***	--

†Sex (Female = 1, Male = 0); Marital Status (Married = 1, Unmarried = 0); College/School (Natural Sciences = 1, Other = 0); Race/Ethnicity (White = 1, Other = 0); Nationality (US = 1, Other = 0).
*p < .05, **p < .01, ***p < .001

Hierarchical Multiple Regression

Hierarchical multiple regression was used to assess the ability of work meaningfulness, supervisor support, stress, and positive emotions in explaining work engagement among postdocs, after controlling for the influences of a variety of demographic controls (viz., age, number of children, employment length, sex, marital status, college/school, race/ethnicity, and nationality).

As displayed in Table 16, the control variables were entered into Model 1, but they did not significantly account for any variance in work engagement ($F_{8, 187} = .93$, $p > .05$). Following the addition of work meaningfulness and supervisor support in Model 2, the total variance explained was estimated at 58% ($F_{10, 185} = 25.04$, $p < .001$). In Model 3, stress was entered into the equation, and the model accounted for an additional 2% of the variance in work engagement (F change$_{1, 184} = 10.17$, $p < .01$). In the final step, Model 4, positive emotions was included, and this step explained an additional 2% in the model R^2 (F change$_{1, 183} = 10.04$, $p < .01$); altogether, the final model accounted for a total of 62% of the variance in work engagement ($F_{12, 183} = 24.71$, $p < .01$).

Work meaningfulness ($B = .84$, $p < .001$), stress ($B = -.02$, $p < .05$), and positive emotions ($B = .03$, $p < .01$) were expectedly associated with work engagement. While holding all else constant, work meaningfulness appeared to have the strongest unique contribution to explaining work engagement ($\beta = .56$, $sr^2 = .20$)—for every standard deviation work meaningfulness is increased, work engagement is also expected to increase by .56 standard deviation; the squared semipartial correlation coefficient (sr^2)

indicates the unique variance associated with each variable, and estimates that the model R^2 will decrease by 20% if work meaningfulness is excluded from the equation. After work meaningfulness, the second strongest determinant of work engagement was positive emotions (β = .20, sr^2 = .02), followed by stress (β = -.12, sr^2 = .01). However, the association between supervisor support and work engagement unexpectedly became non-significant in the final model (B = .09, β = .08, sr^2 = .004, p > .05).

Table 16. Hierarchical regression of work engagement on controls and focal predictors (n = 196).

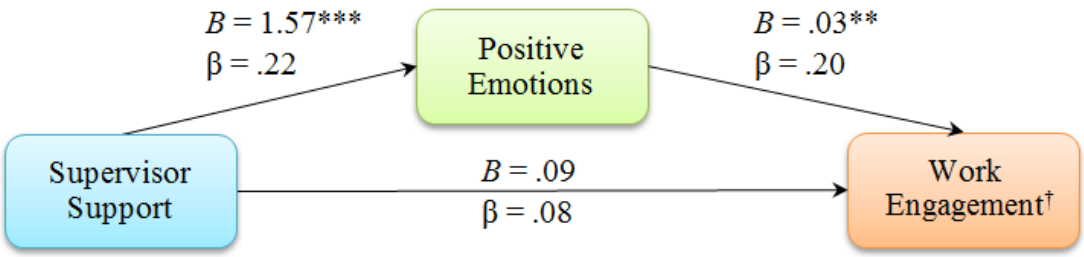
	Model 1			Model 2			Model 3			Model 4		
Variable	*B*	SE *B*	β	*B*	SE *B*	β	*B*	SE *B*	β	*B*	SE *B*	β
Age	.02	.02	.06	-.00	.01	-.00	-.00	.01	-.01	-.00	.01	-.02
Number of Children	.14	.10	.12	-.01	.07	-.01	.03	.07	.02	.02	.07	.02
Employment Length	-.04	.06	-.05	.01	.04	.01	.01	.04	.02	.03	.04	.04
Female †	-.08	.14	-.04	.10	.10	.05	.09	.09	.05	.06	.09	.03
Married †	.05	.15	.03	.07	.10	.04	.04	.10	.02	.05	.10	.03
Natural Sciences †	-.09	.14	-.05	-.02	.10	-.01	-.06	.09	-.04	-.08	.09	-.04
White †	.03	.16	.02	.06	.11	.03	.02	.11	.01	-.01	.10	-.00
US American †	-.13	.16	-.07	-.09	.10	-.05	-.09	.10	-.05	-.07	.10	-.04
Work Meaningfulness				1.00	.08	.67***	.95	.08	.64***	.84	.09	.56***
Supervisor Support				.19	.06	.17**	.13	.06	.12*	.09	.06	.08
Stress							-.03	.01	-.17**	-.02	.01	-.12*
Positive Emotions										.03	.01	.20**
Model R^2			.04			.58			.60			.62
F for change in R^2			.93			116.88***			10.17**			10.04**

†Sex (Female = 1, Male = 0); Marital Status (Married = 1, Unmarried = 0); College/School (Natural Sciences = 1, Other = 0); Race/Ethnicity (White = 1, Other = 0); Nationality (US = 1, Other = 0).
*p < .05, **p < .01, ***p < .001

Positive Emotions Mediate the Effect of Supervisor Support?

The unexpected drop in the significance of supervisor support upon the addition of positive emotions in the final model suggested that positive emotions could be mediating the link between supervisor support and work engagement. To analyze this conceptual model, Preacher and Hayes' (2004) Model INDIRECT script using bootstrap estimation was used to determine if positive emotions in fact mediated the relationship between supervisor support and work engagement—while controlling for demographic covariates as well as the effects of work meaningfulness and stress. As shown on Figure 11, results revealed significant direct paths between supervisor support and positive emotions (B = 1.57, β = .22, p < .001), and between positive emotions and work engagement (B = .03, β = .20, p < .01). After controlling for the effects of positive emotions, work meaningfulness, stress, and the set of demographic covariates, the direct relationship between supervisor support and work engagement was non-significant (B = .09, β = .08, p > .05), indicating that positive emotions completely mediated the link between supervisor support and work engagement. The control variables had non-significant relationships with work engagement, except for stress (B = -.02, β = -.12, p < .05) and work meaningfulness (B = .84, β = .56, p < .001). The indirect effect of supervisor support on work engagement via positive emotions was significant (B = .05, β = .05, p < .05). Taking together the direct and indirect effects, the total effect of supervisor support on work engagement was significant (B = .13, β = .12, p < .05), and the overall model accounted for 62% of the total variance in work engagement.

Figure 11. Conceptual model of positive emotions fully mediating the relationship between supervisor support and work engagement with unstandardized (*B*) and standardized (β) coefficients (*n* = 196).



Indirect effect of supervisor support on work engagement, $B = .05$, $\beta = .05$*
Total effect of supervisor support on work engagement, $B = .13$, $\beta = .12$*
Model $R^2 = .62$***

Note: *$p < .05$, **$p < .01$, ***$p < .001$
†Controlling for age, number of children, employment length, sex, marital status, college/school, race/ethnicity, nationality, work meaningfulness, and stress.

DISCUSSION

Using a sample of n = 200 postdocs, the purpose of the present study was to (a) investigate if stress and positive emotions would significantly account for variance in work engagement, over and above what has been explained by known predictors (viz., work meaningfulness and supervisor support) as well as a variety of demographic covariates; (b) examine how much variance in work engagement can be explained altogether by work meaningfulness, supervisor support, stress, and positive emotions; (c) determine how much unique variance is explained by each independent variable; and (d) compare the strengths of the independent variables and identify the strongest predictors of work engagement among postdocs.

As expected, stress and positive emotions significantly accounted for additional variance in work engagement, although it was relatively small (4%) compared to what was explained by work meaningfulness and supervisor support (58%). These findings nonetheless provide further support for the concept that work engagement is the antipode of burnout, given that positive emotions and stress had opposing associations with work engagement in contrast to their associations with burnout in previous research (Gloria et al., 2012; Steinhardt et al., 2011). In alignment with other findings, work meaningfulness remained to be the strongest determinant of work engagement (May et al., 2004), followed by positive emotions and stress.

Interestingly, the drop in the significance of supervisor support upon entry of positive emotions in the final model indicated that positive emotions may have mediated

the link between supervisor support and work engagement. Further mediation analysis revealed that positive emotions indeed completely mediated the path between supervisor support and work engagement, suggesting that the influence of supervisor support on work engagement depended entirely on how it first affects positive emotions. In other words, work engagement of postdocs may be determined by the quantity and quality of their experienced positive emotions, and the degree of their positive emotions may be determined by the supportiveness of their mentors or supervisors.

According to these findings, supervisors and employers should strive to appoint meaningful work to their postdoc staff (May et al., 2004). In order to optimize the meaningfulness of work to employees, it is important for supervisors to know their staff members and be mindful of each employee's strengths and interests; supervisors should then capitalize on that information and assign work based on individual strengths and interests. In addition, employers should also implement programs to help employees find meaning in their work. Although not all types of work will be apparent with meaning, supervisors can help their staff to understand the meaningfulness and the importance of even the most mundane tasks as they all critically contribute to the overall productivity and success of the team (i.e., a team is only as strong as its weakest link) (Sekerka & Fredrickson, 2008).

In addition, supervisors should strive to maintain positive relationships as well as positive workplace environments with their staff. Fredrickson explained that because an individual's experiences of positive emotions can resonate with other members of the organization, positive emotions and positive work environments can also promote

organizational engagement and flourishing (Fredrickson, 2003). It is also important to foster coworker support, as one study discovered that employees who received coworker support were likely to receive more support from their supervisors (Yoon & Thye, 2000). Lastly, considering the damaging influence of stress on work engagement, employers and supervisors should also offer stress management programs for postdocs in order to foster their full potential to be happy, healthy, engaged, and productive workers.

Results from the present study should be considered in light of the following limitations. The present study used cross-sectional data, and thus causality and directionality cannot be determined from the found associations among the variables. It is also possible that the data may be vulnerable to inaccuracies due to common-methods bias and the self-report nature of the survey instrument. The participants were recruited from a pool of postdocs who were employed at a large research institution in the state of Texas during the spring of 2012. There were no exclusion criteria, and all postdocs from any college or department across the university were allowed to participate. Due to this localized sampling, results and implications may not be applicable to postdocs from other institutions, locations, or time periods.

In conclusion, findings from the present study lend additional support toward the concept that work engagement is the antipode of the burnout syndrome. Results also further confirmed the strong contribution of work meaningfulness to work engagement. Although their relative contributions to explaining work engagement were relatively small, positive emotions and stress were still significant and should be addressed in work engagement programs. Supervisor support is also critical in determining employee

engagement, but supervisors should aim at increasing positive emotions at the workplace by fostering positive interpersonal relationships as well as positive work environments.

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Chapter 7: Conclusion

Guided by Fredrickson's broaden-and-build theory of positive emotions (Fredrickson, 2004, 2005), this dissertation project conducted three studies to explore and examine the multidimensional effects of positive emotions on stress, coping strategies, resilience, trait anxiety, depressive symptoms, and work engagement, using a sample of postdoctoral research fellows (n = 200) from a large research institution in Texas.

Study I: Positive Emotions Enhance Coping, Fuel Resilience, and Protect Individuals Against the Harmful Effects of Stress: Implications of the Broaden-and-Build Theory

The purpose of this study was to examine if (a) positive emotions fueled resilience; (b) coping strategies mediated the link between positive emotions and resilience; and (c) resilience moderated the influence of stress on trait anxiety and depressive symptoms.

Findings from the present study provide additional support for the build and buffering hypotheses of the broaden-and-build theory of positive emotions. Results suggested that positive emotions may fuel resilience directly, as well as indirectly by promoting adaptive coping and demoting maladaptive coping strategies. Although stress was strongly associated with trait anxiety and depressive symptoms, having higher levels of resilience could protect postdocs from developing clinical levels of anxiety and depression. In order to maintain and enhance the well-being of postdocs, programs

should be implemented to increase their positive emotions, adaptive coping, and resilience.

STUDY II: FLOURISHING, LANGUISHING, AND DEPRESSED POSTDOCTORAL FELLOWS: DIFFERENCES IN STRESS, TRAIT ANXIETY, AND DEPRESSIVE SYMPTOMS

The purpose of this study was to examine if groups of flourishing, languishing, and depressed postdocs would significantly differ from each other in scores of stress, trait anxiety, and depressive symptoms.

Findings from the present study provide further support for the mathematically derived positivity ratio cutoff scores developed by Fredrickson and Losada (Fredrickson & Losada, 2005). As expected, flourishing postdocs recorded the lowest scores, while depressed postdocs reported the highest levels of stress, trait anxiety, and depressive symptoms. Although most of the participants' health indicators scored relatively close to the scores of the general population, particular attention should be paid toward addressing anxiety issues among postdocs, given that 35% of postdocs—three times the rate from the general population—reported trait anxiety scores about the cutoff for probably clinical levels of anxiety disorder. Programs should be implemented to increase positive emotions and decrease negative emotions in the day-to-day work and lives of postdocs. Future research should investigate possible explanations behind why postdocs experience such high rates of anxiety.

STUDY III: DETERMINANTS OF WORK ENGAGEMENT AMONG POSTDOCTORAL FELLOWS: THE IMPACTS OF WORK MEANINGFULNESS, SUPERVISOR SUPPORT, STRESS, AND POSITIVE EMOTIONS

The purpose of this study was to (a) investigate if stress and positive emotions would significantly account for variance in work engagement, over and above what has been explained by known predictors (viz., work meaningfulness and supervisor support) as well as a variety of demographic covariates; (b) examine how much variance in work engagement can be explained altogether by work meaningfulness, supervisor support, stress, and positive emotions; (c) determine how much unique variance is explained by each independent variable; and (d) compare the strengths of the independent variables and identify the strongest determinants of work engagement among postdocs.

Findings from the present study lend additional support toward the concept that work engagement is the antipode of the burnout syndrome. Results also further confirmed the strong contribution of work meaningfulness to work engagement. Although their relative contributions to explaining work engagement were relatively small, positive emotions and stress were still significant and should be addressed in work engagement programs. Supervisor support is also critical in determining employee engagement, but supervisors should aim at increasing positive emotions at the workplace by fostering positive interpersonal relationships as well as positive work environments.

Appendix A: Approval from the Office of the VP for Research

VICE PRESIDENT FOR RESEARCH
THE UNIVERSITY OF TEXAS AT AUSTIN

Main Building, Room 302 • (512) 471-2877 • FAX (512) 471-2827
P.O. Box 7996 • Austin, Texas 78713-7996

November 1, 2011

Christian Gloria, PhD Candidate
The University of Texas at Austin
Department of Kinesiology & Health Education
1 University Station, D3700
Austin, Texas 78712

Subject: Post-doctoral fellow engagement and well-being survey

Dear Christian Gloria:

This letter is to confirm that you have permission to conduct your research study and make your online surveys available to the postdoctoral fellows of The University of Texas at Austin, using the email list provided by the Office of the Vice President for Research.

We wish you success in your research project and look forward to hearing about your results.

Sincerely,

Liza Scarborough, Coordinator
Postdoctoral Fellowship Office
Office of the Vice President for Research

Appendix B: Email Invitation/Recruitment Letter

Subject:

Postdoctoral Experience and Well-Being survey. Participants will be compensated.

Body:

Dear UT Austin Postdoctoral Fellow,

I am a PhD candidate in Health Education, and I request your help in completing my dissertation research that will examine the experience and well-being of postdoctoral fellows. Confidential aggregate results will be shared with the Office of the Vice President for Research, and they will use this information to better understand the needs of postdoctoral fellows, improve related programs and services, and ultimately enhance your experiences. Only I and my supervising professor (Dr. Mary Steinhardt) will have access to the data, and all identifying information will be removed from the final dataset.

This study involves only an online survey, consisted of i) quantitative items that will assess your individual characteristics and ii) qualitative questions where you can share details of your experiences, needs, and recommendations on how the university could improve the postdoctoral fellowship program.

Your participation will be compensated with a $5 Starbucks giftcard, a deck of inspirational quote cards, and an Individual Feedback Profile which will provide a summary of your personal results. You will also be entered into a drawing for larger prizes such as restaurant giftcards, Visa giftcards, iPod Shuffles, and Amazon Touch Kindles (a large prize will be given away for every 15 surveys we receive).

For full details and to complete the survey, click on the following link:

Take the Survey

We sincerely hope that you choose to help us in this important study. However, if you do not wish to participate, reply to this email and enter "no survey" on the subject line. By doing so, you will be removed from our list of participants and you will not receive any future emails. If you have any questions about this study, please do not hesitate to contact us.

Best Regards,

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Appendix C: Consent to Participate in Internet Research

Dear UT Austin Postdoctoral Fellow,

You are invited to participate in a research study, entitled "The flourishing fellowship: Determinants of successful postdoctoral experiences." This study is being conducted by Christian Gloria and Mary Steinhardt from the Department of Kinesiology and Health Education of The University of Texas at Austin (see contact information below).

Purpose of Study

The purposes of this study are to i) identify ways to enhance the personal and professional experiences of postdoctoral fellows at The University of Texas at Austin, and ii) examine potential determinants of employee success and well-being. Your participation in this study will help the Office of the Vice President for Research in developing programs and resources to better serve you and the postdoctoral community. You are welcome to contact the investigators to discuss this study.

If you agree to participate:

- The online survey will take approximately 30 minutes of your time.
- You will read a variety of short questions/statements which will require you to either type a response or select from multiple-choice options. The survey items will assess your thoughts regarding your professional and personal experiences, individual characteristics, and feelings about work.
- You will be compensated for completing this survey:
    - Every participant will receive a confidential Individual Feedback Profile which will provide a summary of your personal data. Info sessions will be offered where profile results and recommendations will be discussed.

- Every participant will also receive a $5 Starbucks giftcard, a deck of 50 inspirational quote cards, and will be entered into a lottery drawing for larger prizes: (15) $10 and (10) $25 restaurant giftcards, (5) $50 Visa giftcards, (3) iPod Shuffles, and (2) Amazon Touch Kindles. One prize will be given away for every 15 surveys received. Winners will be contacted and will choose from the pool of available prizes (first drawn, first served). You will be asked for your confidential contact information at the end of the survey so that we may deliver your Individual Feedback Profile, Starbucks giftcard, inspirational quote cards, and any additional prize you win.

Risks, Benefits, and Confidentiality of Data

While we do not anticipate any risk or discomfort as you complete the survey, it is possible that you may experience some distress from becoming more aware of your stressors and emotions. If you feel distress and need assistance, please contact the university's counseling center at (512) 471-3515. Participation involves no costs; however, you will benefit by receiving the said compensation, plus your contribution will help the University to better understand your needs, which will ultimately improve the services available to you and enhance your postdoctoral experience. Your name and contact information will be kept strictly confidential, and used only for tracking and delivery of your compensation. Only the investigators will have access to the data, and all identifying information will be removed from the final dataset.

Participation or Withdrawal

Your participation in this study is voluntary. You may decline to answer any question and you have the right to withdraw from participation at any time. Withdrawal will not affect your relationship with The University of Texas in any way. However, participants must complete the entire survey to be eligible for compensation. If you do not want to participate, either simply stop participating or close the browser window. If you do not

want to receive any more reminders or to opt out of future emails, notify the investigator at ctgloria@utexas.edu.

Contacts

If you have any questions about this study or need to update your email address, contact the investigators listed below. This study has been approved by The University of Texas at Austin Institutional Review Board; the study number is 2011-11-0018. If you have questions about your rights as a research participant or are dissatisfied at any time with any part of this study, you may contact (anonymously if you wish) the Institutional Review Board by phone at (512) 471-8871 or email at orsc@uts.cc.utexas.edu.

If you agree to participate, click the [Next >>] button at the bottom right of the screen to begin the survey. Please complete this survey by February 29, 2012.

Thank you for your time and contribution toward this important study.

Sincerely,

Christian T Gloria, MA, CHES
PhD Candidate in Health Promotion
The University of Texas at Austin, College of Education
Department of Kinesiology and Health Education
Phone: (512) 799-1444; Fax: (512) 232-5560
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Appendix D: Qualtrics Online Survey

Demographics (12 items), Job Satisfaction (1 item), & Job Productivity (1 item)
What is your age? 0 years old
What is your gender?
What is your race/ethnicity?
What is your nationality (country of origin)?
What is your marital status?
How many children do you have? 0 # of children
What is your official job title (e.g., postdoctoral fellow, research associate, etc.)?
In what college/school of The University of Texas at Austin do you work?
In what department/division of The University of Texas at Austin do you work?

How long have you been employed in this title at The University of Texas at Austin?

0 Year(s) and

0 Month(s)

How are you funded?

- ☐ Laboratory Grant
- ☐ UT Fellowship
- ☐ Private Fellowship
- ☐ Government Fellowship
- ☐ Other (explain below)

What are your career goals?

- ☐ Academia (Research University)
- ☐ Academia (Undergraduate Institution)
- ☐ Government Research (e.g., NIH Lab)
- ☐ Industry (Research or Administration)
- ☐ Other (explain below)

Taking everything into consideration, as a postdoc/research fellow, how do you feel about your job as a whole?

Extremely Dissatisfied	Very Dissatisfied	Moderately Dissatisfied	Not Sure	Moderately Satisfied	Very Satisfied	Extremely Satisfied
○	○	○	○	○	○	○

Taking everything into consideration, as a postdoc/research fellow, how do you feel about your work productivity as a whole?

Extremely Unproductive	Very Unproductive	Moderately Unproductive	Not Sure	Moderately Productive	Very Productive	Extremely Productive
○	○	○	○	○	○	○

Work Engagement (UWES 9 items; Schaufeli et al, 2006)

INSTRUCTIONS:
The following statements are about <u>how you feel at work as a postdoc/research fellow</u>.
Indicate <u>how often</u> you've felt each of the following statements.

1) At my work, I feel bursting with energy.

Never	Almost Never /	Rarely /	Sometimes /	Often /	Very Often /	Always /

	Few Times a Year or Less	Once a Month or Less	Few Times a Month	Once a Week	Few Times a Week	Everyday
○	○	○	○	○	○	○

2) At my job, I feel strong and vigorous.

Never	Almost Never / Few Times a Year or Less	Rarely / Once a Month or Less	Sometimes / Few Times a Month	Often / Once a Week	Very Often / Few Times a Week	Always / Everyday
○	○	○	○	○	○	○

3) I am enthusiastic about my job.

Never	Almost Never / Few Times a Year or Less	Rarely / Once a Month or Less	Sometimes / Few Times a Month	Often / Once a Week	Very Often / Few Times a Week	Always / Everyday
○	○	○	○	○	○	○

4) My job inspires me.

Never	Almost Never / Few Times a Year or Less	Rarely / Once a Month or Less	Sometimes / Few Times a Month	Often / Once a Week	Very Often / Few Times a Week	Always / Everyday
○	○	○	○	○	○	○

5) When I get up in the morning, I feel like going to work.

Never	Almost Never / Few Times a Year or Less	Rarely / Once a Month or Less	Sometimes / Few Times a Month	Often / Once a Week	Very Often / Few Times a Week	Always / Everyday
○	○	○	○	○	○	○

6) I feel happy when I am working intensely.

Never	Almost Never / Few Times a Year or Less	Rarely / Once a Month or Less	Sometimes / Few Times a Month	Often / Once a Week	Very Often / Few Times a Week	Always / Everyday
○	○	○	○	○	○	○

7) I am proud of the work that I do.

Never	Almost Never / Few Times a Year or Less	Rarely / Once a Month or Less	Sometimes / Few Times a Month	Often / Once a Week	Very Often / Few Times a Week	Always / Everyday
○	○	○	○	○	○	○

8) I am immersed in my work.

Never	Almost Never / Few Times a Year or Less	Rarely / Once a Month or Less	Sometimes / Few Times a Month	Often / Once a Week	Very Often / Few Times a Week	Always / Everyday
○	○	○	○	○	○	○

9) I get carried away when I am working.

Never	Almost Never / Few Times a Year or Less	Rarely / Once a Month or Less	Sometimes / Few Times a Month	Often / Once a Week	Very Often / Few Times a Week	Always / Everyday
○	○	○	○	○	○	○

Positivity (mDES 20 items; Fredrickson et al, 2003)

INSTRUCTIONS:
Think back to how you've felt during the past two weeks.
Indicate how often you've felt each of the following emotions.

1) In the past two weeks, I have felt **amused**, **fun-loving**, or **silly**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

2) In the past two weeks, I have felt **angry**, **irritated**, or **annoyed**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

3) In the past two weeks, I have felt **ashamed**, **humiliated**, or **disgraced**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

4) In the past two weeks, I have felt **awe**, **wonder**, or **amazement**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

5) In the past two weeks, I have felt **contemptuous**, **scornful**, or **disdainful**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

6) In the past two weeks, I have felt **disgust**, **distaste**, or **revulsion**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

7) In the past two weeks, I have felt **embarrassed**, **self-conscious**, or **blushing**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

8) In the past two weeks, I have felt **grateful**, **appreciative**, or **thankful**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

9) In the past two weeks, I have felt **guilty**, **repentant**, or **blame-worthy**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

10) In the past two weeks, I have felt **hate**, **distrust**, or **suspicion**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

11) In the past two weeks, I have felt **hopeful**, **optimistic**, or **encouraged**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

12) In the past two weeks, I have felt **inspired**, **uplifted**, or **elevated**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

13) In the past two weeks, I have felt **interested**, **alert**, or **curious**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

14) In the past two weeks, I have felt **joyful**, **glad**, or **happy**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

15) In the past two weeks, I have felt **love**, **closeness**, or **trust**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

16) In the past two weeks, I have felt **proud**, **confident**, or **self-assured**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

17) In the past two weeks, I have felt **sad**, **downhearted**, or **unhappy**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

18) In the past two weeks, I have felt **scared**, **fearful**, or **afraid**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

19) In the past two weeks, I have felt **serene**, **content**, or **peaceful**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

20) In the past two weeks, I have felt **stressed**, **nervous**, or **overwhelmed**.

Never	Hardly	Some of the Time	Often	Most of the Time
○	○	○	○	○

Personal Engagement (33 items; May et al, 2004)

INSTRUCTIONS:
The following statements assess how you feel about your work as a postdoc/research fellow.
Please indicate the extent to which you agree with each of the following statements.

1) Performing my job is so absorbing that I forget about everything else.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

2) I often think about other things when performing my job.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

3) I am rarely distracted when performing my job.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

4) Time passes quickly when I perform my job.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

5) I really put my heart into my job.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

6) I get excited when I perform well on my job.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

7) I often feel emotionally detached from my job.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

8) My own feelings are affected by how well I perform my job.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

9) I exert a lot of energy performing my job.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

10) I stay until the job is done.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

11) I avoid working overtime whenever possible.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

12) I take work home to do.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

13) I avoid working too hard.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

14) The work I do on my job is very important to me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

15) My job activities are personally meaningful to me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

16) The work I do on this job is worthwhile.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

17) My job activities are significant to me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

18) The work I do on this job is meaningful to me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

19) I feel that the work I do on my job is valuable.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

20) My job "fits" how I see myself.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

21) I like the identity my job gives me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

22) The work I do on this job helps me satisfy who I am.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

23) My job "fits" how I see myself in the future.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

24) My supervisor helps me solve work-related problems.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

25) My supervisor encourages me to develop new skills.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

26) My supervisor keeps me informed about how employees think and feel about things.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

27) My supervisor encourages employees to participate in important decisions.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

28) My supervisor praises good work.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

29) My supervisor encourages employees to speak up when they disagree with a decision.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

30) Employees are treated fairly by my supervisor.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

31) My supervisor is committed to protecting my interests.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

32) My supervisor does what he/she says he/she will do.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

33) I trust my supervisor.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

Perceived Stress (PSS 10 items; Cohen & Williamson, 1988)

INSTRUCTIONS:
The questions on this page ask about your feelings and thoughts during the past month.
In each case, please indicate how often you felt or thought a certain way.

1) In the past month, how often have you been upset because of something that happened unexpectedly?

Never ○ Almost Never ○ Sometimes ○ Fairly Often ○ Very Often ○

2) In the past month, how often have you felt that you were unable to control the important things in your life?

Never ○ Almost Never ○ Sometimes ○ Fairly Often ○ Very Often ○

3) In the past month, how often have you felt nervous and "stressed"?

Never ○ Almost Never ○ Sometimes ○ Fairly Often ○ Very Often ○

4) In the past month, how often have you felt confident about your ability to handle personal problems?

Never ○ Almost Never ○ Sometimes ○ Fairly Often ○ Very Often ○

5) In the past month, how often have you felt that things were going your way?

Never ○ Almost Never ○ Sometimes ○ Fairly Often ○ Very Often ○

6) In the past month, how often have you found that you could not cope with all the things that you had to do?

Never ○ Almost Never ○ Sometimes ○ Fairly Often ○ Very Often ○

7) In the past month, how often have you been able to control irritations in your life?

Never ○ Almost Never ○ Sometimes ○ Fairly Often ○ Very Often ○

8) In the past month, how often have you felt that you were on top of things?

Never ○ Almost Never ○ Sometimes ○ Fairly Often ○ Very Often ○

9) In the past month, how often have you been angered because of things that happened that were outside of your control?

Never	Almost Never	Sometimes	Fairly Often	Very Often
○	○	○	○	○

10) In the past month, how often have you felt difficulties were piling up so high that you could not overcome them?

Never	Almost Never	Sometimes	Fairly Often	Very Often
○	○	○	○	○

Coping (Brief COPE 28 items; Carver, 1997)

INSTRUCTIONS:
Please indicate what you usually do and feel when experiencing stressful events. Obviously, different events bring out somewhat different responses, but think about what you usually do and feel when you are under stress.

1) I concentrate my efforts on doing something about the situation I'm in.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

2) I try to come up with a strategy about what to do.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

3) I try to see it in a different light, to make it seem more positive.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

4) I accept the reality of the fact that it happened.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

5) I make jokes about it.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

6) I try to find comfort in my religion or spiritual beliefs.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

7) I try to get emotional support from others.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

8) I try to get advice or help from other people about what to do.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

9) I turn to other activities to take my mind off things.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

10) I say to myself "this isn't real."

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

11) I say things to let my unpleasant feelings escape.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

12) I use alcohol or other drugs to make myself feel better.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

13) I just give up trying to deal with it.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

14) I criticize myself.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

15) I take action to try to make the situation better.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

16) I think hard about what steps to take.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

17) I look for something good in what is happening.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

18) I learn to live with it.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

19) I make fun of the situation.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

20) I pray or meditate.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

21) I get comfort and understanding from someone.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

22) I get help and advice from other people.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

23) I do something to think about it less, such as go to the movies, watch TV, read, daydream, sleep, or shop.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

24) I refuse to believe that it has happened.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

25) I express my negative feelings.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

26) I use alcohol and other drugs to help me get through it.

Not At All	A Little Bit	A Medium Amount	A Lot

○	○	○	○

27) I give up the attempt to cope.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

28) I blame myself for things that happened.

Not At All	A Little Bit	A Medium Amount	A Lot
○	○	○	○

Resilience (BRS 6 items; Smith et al, 2008)

INSTRUCTIONS:
Please indicate the extent to which you agree with each of the following statements.

1) I tend to bounce back quickly after hard times.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

2) I have a hard time making it through stressful events.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

3) It does not take me long to recover from a stressful event.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

4) It is hard for me to snap back when something bad happens.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

5) I usually come through difficult times with little trouble.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

6) I tend to take a long time to get over set-backs in my life.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

Trait Anxiety (STAI FormY-2 20 items; Spielberger, 1968, 1977)

INSTRUCTIONS:
Read each statement and then indicate how you <u>generally</u> feel.

1) I feel pleasant.

Almost Never | Sometimes | Often | Almost Always

2) I feel nervous and restless.

Almost Never | Sometimes | Often | Almost Always

3) I feel satisfied with myself.

Almost Never | Sometimes | Often | Almost Always

4) I wish I could be as happy as others seem to be.

Almost Never | Sometimes | Often | Almost Always

5) I feel like a failure.

Almost Never | Sometimes | Often | Almost Always

6) [illegible]

Almost Always

7)

Almost Always

8)

Almost Always

9) [illegible]

Almost Never | Sometimes | Often | Almost Always

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10)	I may only append five sample items from this Trait Anxiety Scale because of copyright agreement. "Five sample items from this instrument may be reproduced for inclusion in a proposal, thesis, or dissertation." © 1968, 1977 Charles D. Spielberger Published by Mind Garden, Inc. www.mindgarden.com	Almost Always
11)		Almost Always
12)		Almost Always
13)		Almost Always
14)		Almost Always
15)		Almost Always
16)		Almost Always
17)		Almost Always
18)		Almost Always
19)		

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Almost Always

20)

Almost Always

Depressive Symptoms (CES-D 20 items; Radloff, 1977)

INSTRUCTIONS:
Below is a list of some of the ways you may have felt or behaved.
Please indicate how often you have felt this way during the past week.

1) In the past week, I was bothered by things that usually don't bother me.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)

2) In the past week, I did not feel like eating; my appetite was poor.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)

3) In the past week, I felt that I could not shake off the blues even with help from my family or friends.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)

4) In the past week, I felt that I was just as good as other people.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)

5) In the past week, I had trouble keeping my mind on what I was doing.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)

○	○	○	○

6) In the past week, I felt depressed.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

7) In the past week, I felt that everything I did was an effort.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

8) In the past week, I felt hopeful about the future.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

9) In the past week, I thought my life had been a failure.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

10) In the past week, I felt fearful.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

11) In the past week, my sleep was restless.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

12) In the past week, I was happy.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

13) In the past week, I talked less than usual.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

14) In the past week, I felt lonely.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

15) In the past week, people were unfriendly.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

16) In the past week, I enjoyed life.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

17) In the past week, I had crying spells.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

18) In the past week, I felt sad.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

19) In the past week, I felt that people dislike me.

Rarely or None of the Time (Less than 1 day)	Some or a Little of the Time (1 - 2 days)	Occasionally or a Moderate Amount of the Time (3 - 4 days)	Most or All of the Time (5 - 7 days)
○	○	○	○

20) In the past week, I could not get "going."

Rarely or None of the Time	Some or a Little of the Time	Occasionally or a Moderate	Most or All of the Time

(Less than 1 day)	(1 - 2 days)	Amount of the Time (3 - 4 days)	(5 - 7 days)
○	○	○	○

Participant Contact Info

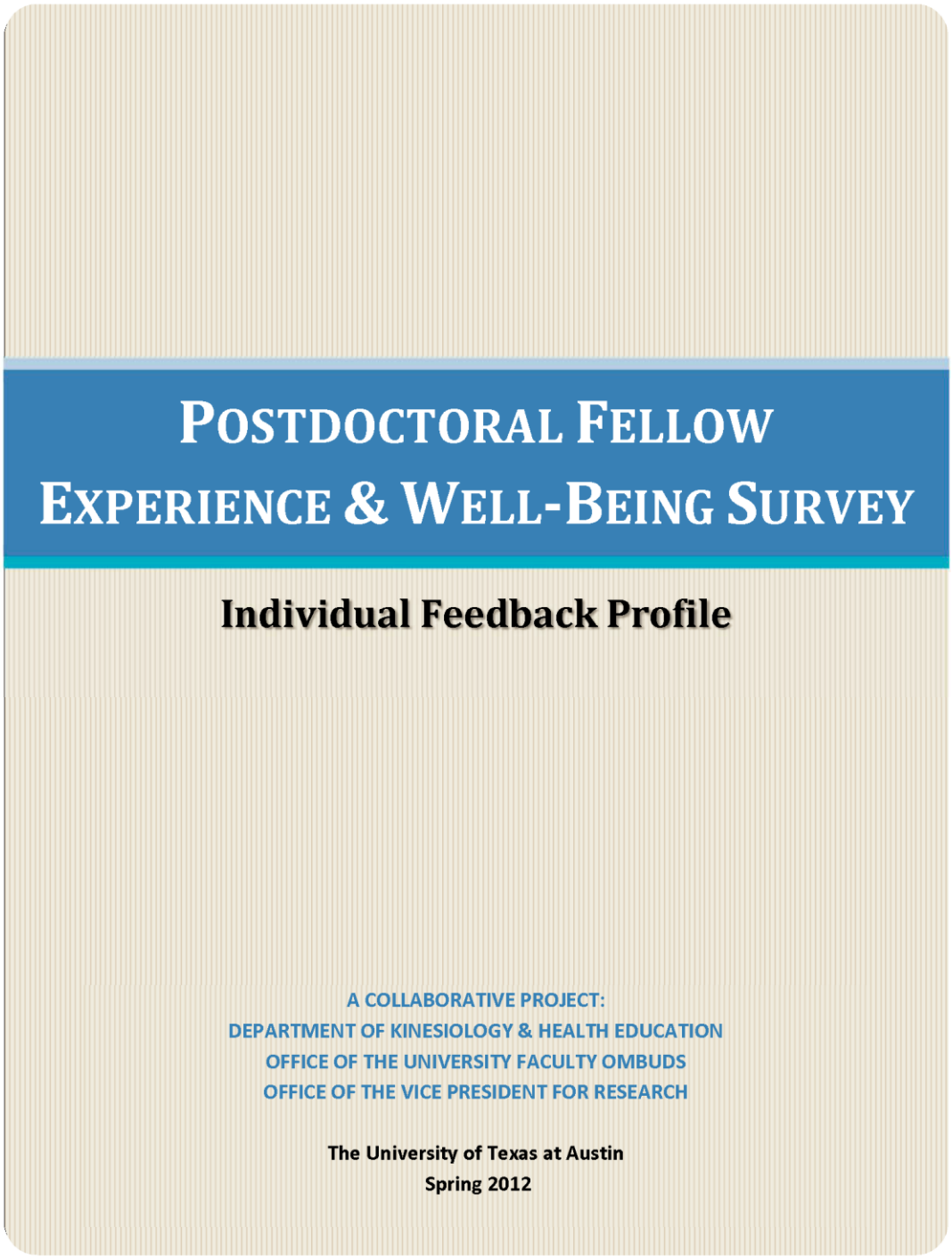
INSTRUCTIONS:
Please enter your contact information below so that we may deliver your participation compensation (Individual Feedback Profile, $5 Starbucks gift card, and a deck of 50 inspirational quote cards). You will also be entered into a lottery drawing for larger prizes such as $10 and $25 restaurant giftcards, $50 Visa giftcards, iPod Shuffles, and Amazon Touch Kindles. One prize will be given away for every 15 surveys we receive. **Your information will be kept confidential** and will only be accessible to the investigators of this study: Christian Gloria (512-799-1444, ctgloria@utexas.edu) and Mary Steinhardt (512-232-3535, msteinhardt@austin.utexas.edu).

If you win a large lottery prize, we will send you a notification email so you could tell us which item you want to collect. We will deliver your compensation/prize via campus mail (your home address is also acceptable if you prefer that).

First Name	
Last Name	
Email Address	
Campus Mail Address (or Home Address)	
City	
State	
Zip Code	

Thank you for your time and valuable contribution.
Click the [Next] button below to submit your responses and end the survey.

Appendix E: Individual Feedback Profile



INTRODUCTION

Thank you for participating in the Postdoctoral Experience & Well-Being Survey. The goal of this project is to identify ways to enhance the professional and personal experiences of postdoctoral fellows at The University of Texas at Austin. Through your participation, we now have a better understanding of the strengths and needs of the postdoctoral community and how the Postdoctoral Office can more effectively foster its success and well-being. As noted when you completed the survey, in addition to providing you with individual feedback, confidential aggregate results will be shared with the Office of the Vice President for Research. This information (e.g., your responses and feedback) will be used to develop programs, services, and resources to better serve you, the postdoctoral community, and the overall University community.

The confidential Individual Feedback Profile that you received by mail describes your individual data as well as a summary of how you compared to your peers. This document provides strategies to enhance your health, productivity, and personal and professional success, as well as recommendations for stress management. The tables on the next two pages summarize a variety of demographic information and overall survey results from all of the participants (n = 211) in the study. In addition, the following sections of this document present each of the variables that were measured by the online survey, discuss how each variable is defined, show examples of the questions you answered, and explain how you can meaningfully interpret the scores you received.

Table of Contents

If you have any questions or comments, please feel free to contact us via email or phone (listed below). In addition, we welcome your attendance at one of the upcoming information sessions we provide (see page 12 for dates and times). Again, we thank you for your valuable contributions and hope that the results will prove to be informative and valuable to your professional, as well as personal, growth and development.

Best Regards,

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PARTICIPANT DEMOGRAPHICS

Study Response Rate	39.51%
Invited Participants	n = 534
Surveys Completed	n = 211

Age	Years
Mean	32.07
Standard Deviation	3.74
Minimum	26
Maximum	52

Sex	Count	%
Male	125	59.24%
Female	86	40.76%

Race/Ethnicity	Count	%
White or Caucasian	135	63.98%
Asian or Pacific Islander	37	17.54%
Hispanic or Latino	17	8.06%
Indian or South Asian	16	7.58%
Black or African American	1	0.47%
Other	5	2.37%

Marital Status	Count	%
Married	127	60.19%
Single	65	30.81%
Living with a Partner	14	6.64%
Divorced	3	1.42%
Other	2	0.95%

Number of Children	#
Mean	0.45
Standard Deviation	0.82
Minimum	0
Maximum	4

Length of Employment	Years
Mean	1.52
Standard Deviation	1.26
Minimum	0.08
Maximum	6.67

College/School of Employment	Count	%
College of Natural Sciences	101	48.10%
School of Engineering	41	19.52%
College of Liberal Arts	16	7.62%
School of Geosciences	12	5.71%
College of Pharmacy	11	5.24%
College of Education	3	1.43%
College of Communication	2	0.95%
School of Public Affairs	2	0.95%
School of Social Work	2	0.95%
Other	20	9.52%

Nationality (Country of Origin)	Count	%
USA	108	51.43%
China	21	10.00%
India	14	6.67%
South Korea	8	3.81%
United Kingdom	7	3.33%
Canada	6	2.86%
Germany	5	2.38%
Israel	5	2.38%
France	4	1.90%
Iran	4	1.90%
Spain	3	1.43%
Taiwan	3	1.43%
Italy	2	0.95%
Mexico	2	0.95%
Argentina	1	0.48%
Australia	1	0.48%
Brazil	1	0.48%
Chile	1	0.48%
Czech Republic	1	0.48%
Denmark	1	0.48%
Georgia	1	0.48%
Ireland	1	0.48%
Japan	1	0.48%
Lebanon	1	0.48%
The Netherlands	1	0.48%
Palestine	1	0.48%
Peru	1	0.48%
Poland	1	0.48%
Romania	1	0.48%
Singapore	1	0.48%
Sri Lanka	1	0.48%
Venezuela	1	0.48%

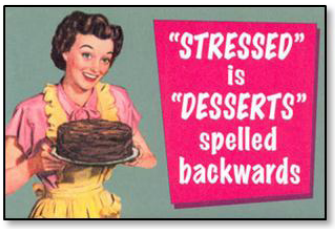
OVERALL SUMMARY RESULTS

The table below lists the variables measured by the survey you completed. The average scores are reported, along with the standard deviations, range scores from all UT Austin participants (n = 211), as well as the minimum-to-maximum range of possible scores. The last column (Reference Page) indicates where in this document you can find more information about each variable. This same information was listed on the Individual Feedback Profile that was mailed to you and included your personal scores.

Variable	Your Score	Variable Range	Average (SD)	Range	Reference Page
General Stress	#	0 - 40	16.30 (5.71)	0 - 31	3
Adaptive Coping	#	16 - 64	44.95 (6.14)	28 - 58	4
Maladaptive Coping	#	12 - 48	21.35 (3.82)	12 - 33	5
Resilience	#	1 - 5	3.63 (.69)	1.33 - 5	6
Positivity Ratio (P/N)	#	0 - 10	1.82 (1.50)	0 - 10	7
• Positive Emotions (P)	#	0 - 10	8.51 (1.95)	0 - 10	7
• Negative Emotions (N)	#	1 - 10	6.30 (2.59)	1 - 10	7
Work Engagement	#	0 - 6	4.40 (.92)	0 - 6	8
Job Productivity	#	1 - 7	5.36 (1.04)	1 - 7	9
Job Satisfaction	#	1 - 7	5.29 (1.15)	1 - 7	9
General Anxiety	#	20 - 80	39.73 (9.04)	20 - 69	10
Depressive Symptoms	#	0 - 60	10.66 (7.58)	0 – 37	11

NOTE: These results only represent the quantitative portion of the survey measures (i.e., numerical- and scale-based data). The collected qualitative responses (i.e., open-ended text feedback) were confidentially shared with the Office of the Vice President for Research without any identifying information. These data will be used to enhance programming, services, and resources to better serve the postdoctoral community. A summary of the qualitative data will be presented at the Information Sessions (see page 12 for dates and times).

GENERAL STRESS



You completed 10 items that assessed your level of general stress during the last month. This variable was measured using the Perceived Stress Scale (PSS; Cohen & Williamson, 1988). General stress is the degree to which you experience situations in your life as difficult, challenging, and stressful. Higher scores on this measure indicate that you reported experiencing higher levels of general stress. The higher you scored on general stress, the more likely you were to respond "very often" to the following sample items from the survey:

- *How often have you felt that you were unable to control the important things in your life?*
- *How often have you felt that things were not going your way?*
- *How often have you found that you could not cope with all the things that you had to do?*
- *How often have you felt nervous and "stressed"?*
- *How often have you felt difficulties were piling up so high that you could not overcome them?*

Whether or not an event is stressful does not necessarily depend on the magnitude or intensity of the event, but rather on your interpretation of the event. Two factors determine whether or not you perceive an event as stressful: 1) if the situation is appraised as threatening to you in some way; and 2) if you perceive that you have insufficient resources available to deal effectively with the situation.

Your degree of general stress can be influenced by the ongoing level of stress in your work and personal life, as well as your reactions to past experiences and expectations about future events. A key to successfully managing life's stressful challenges is to be flexible and focused on the aspects of stressful situations that you can influence or change. Quite often it is in the struggle to survive a stressful situation that leads to the emergence of a new way of being that is more satisfying and productive than the old.

When we get pushed off our secure foundation because of some stressful situation, we can realize that it may be an opportunity to grow to a higher level of functioning. Although we feel vulnerable, it's during this time of vulnerability that we also have tremendous potential to grow to a higher level of functioning. And we want to take advantage of these opportunities! We realize that stress and disruption in life are normal; change is inevitable. When life is easy, we don't have these opportunities to grow. Our challenge, then, when faced with a stressful situation, is to say to ourselves, "Yes, I feel vulnerable, but I also have a tremendous opportunity to grow... to transform this stressful situation into personal growth."

Just think of it as exercising. If you have ever lifted weights, you purposely overload your muscles. Your muscles become vulnerable, maybe even shaky, but you overload them because you want the opportunity to grow physically. Psychological growth is no different. Of course, we don't purposely stress ourselves out, but when life throws us a curve ball, we can begin to look at it like lifting weights. Our system is simply overloaded, **we're vulnerable... and we have a tremendous opportunity to grow!**

ADAPTIVE COPING

You completed 28 items that assessed a variety of ways individuals typically cope with stressful life situations, which was measured by the Brief COPE instrument (Carver, 1997). Sixteen items measured *adaptive coping* strategies while the remaining 12 items measured *maladaptive coping* strategies.

Stressful work and life experiences result from an imbalance between the demands from the world around us and our coping capabilities to respond to these challenges. Excess demands create a tension or disruption that requires us to cope to reestablish order in our lives.

Each of us has strategies for coping with the stressors we encounter each day. These strategies are developed over a lifetime and result from our perceptions of behaviors and attitudes that alleviated stress in the past. When confronted with new stressful situations, we tend to use habitual ways of coping. Sometimes, these coping strategies are effective; in other situations, however, new resources or alternative ways of coping may be more appropriate. Over time, the process and experience of adapting successfully to disruptive and challenging stressful events result in an enhanced ability to cope effectively. Homeostasis or balance is achieved by acquiring new resources and coping behaviors, reducing demands, and/or changing one's perception associated with the stressful situation.

Adaptive coping is aimed at problem solving or taking action to alter the source of stress. The utility of adaptive coping strategies during times of stress typically results in improved outcomes, in contrast to maladaptive strategies (discussed on the next page) which usually lead to undesirable consequences. Adaptive coping includes the following subscales: active coping, planning, positive reframing, acceptance, humor, religion, emotional support, and instrumental support. Higher scores on this measure suggest that you more frequently use adaptive coping strategies during times of stress, and that you are more likely to implement some of the following sample items from the survey:

- *I take action to try to make the situation better.*
- *I try to come up with a strategy about what to do.*
- *I look for something good in what is happening.*
- *I try to get advice or help from other people about what to do.*

Active Coping is the process of taking steps to either remove the stressor or to lessen its effects.
Planning is thinking about how to best cope with the stressor.
Positive Reframing involves looking at the stressful situation in a different way and trying to view it in a different light.
Acceptance is the opposite of denial. A person who accepts the reality of a stressor is engaged in the attempt to cope with the situation.
Humor is the process of reducing the severity of a stressor to make it seem easier to manage and tackle.
Religion may be considered as a source of emotional support as well as a vehicle for positive reframing.
Emotional Support involves turning to other people for comfort, sympathy, and understanding.
Instrumental Support is seeking advice and assistance from others about how to deal with the stressor.

MALADAPTIVE COPING

You completed 28 items that assessed a variety of ways individuals typically cope with stressful life situations, which was measured by the Brief COPE instrument (Carver, 1997). Twelve of these items measured *maladaptive coping* strategies.

Maladaptive coping strategies are typically used when individuals feel overwhelmed when trying to reduce or manage the stressful situation. Although these strategies typically result in poorer outcomes, especially if used over long periods of time, they are often helpful in managing short-lived stressors and stressors that are out of one's control. The maladaptive coping scale has six subscales: self-distraction, denial, venting, substance use, behavioral disengagement, and self-blame. The higher your maladaptive coping score, the more frequently you use maladaptive coping strategies and the more likely the following sample items from the survey describe you:

- *I turn to other activities to take my mind off things.*
- *I refuse to believe that it has happened.*
- *I say things to let my unpleasant feelings escape.*
- *I just give up trying to deal with it.*

Self-Distraction means you distract yourself from thinking about the stressful situation (e.g., watching TV, daydreaming, or sleeping instead of attempting to deal with the source of stress).
Denial is the refusal to believe that the stressor exists or trying to act as though the stressor is not real. Denying the reality of a stressful event that needs your attention usually results in the event becoming more serious, and the coping that eventually must occur more difficult.
Venting involves the tendency of focusing on the distress that one is experiencing and ventilating those feelings. Such a response is sometimes helpful. However, in most circumstances, focusing on upsetting emotions, particularly for long periods of time, can impede adjustment.
Substance Use involves using alcohol or other drugs to make oneself feel better. This harmful behavior is an attempt to distract from, deny, or disengage from stressors that are perceived to be overwhelming.
Behavioral Disengagement is reducing the effort to deal with the stressor, even giving up the attempt to attain goals with which the stressor is interfering. Behavioral disengagement is most often associated with feelings of helplessness and used when undesirable outcomes are expected.
Self-Blame involves criticizing oneself for being responsible for a stressful situation. This maladaptive way of coping focuses one's attention to self instead of more adaptively focusing on managing the stressor.

Although most stressful life experiences elicit adaptive and maladaptive types of coping, individuals typically use adaptive coping strategies when they feel something constructive can be done to alleviate the stress, such as working on a project deadline at work. Maladaptive coping tends to dominate when people feel overwhelmed by the stressor or if the stressor is something they cannot escape and must endure, such as caring for a sick friend or family member with a chronic disease. While maladaptive coping strategies can be helpful in the short term, over time they can become ineffective and lead to poorer outcomes; thus, using a higher percentage of adaptive coping strategies than maladaptive coping strategies is most effective (see page 4).

RESILIENCE

Using the Brief Resilience Scale (BRS; Smith et al., 2008), you completed six items that assessed your level of resilience and ability to bounce back or recover from stress, such as work demands and difficult life events. Resilient individuals have the psychological and physical resources necessary to successfully manage challenges and rebound from stressful situations. The higher your resilience score, the more likely the following statements from the survey describe you:

- *I tend to bounce back quickly after hard times.*
- *It does not take me long to recover from a stressful event.*
- *I usually come through difficult times with little trouble.*

The term resilience reflects three personal qualities often referred to in the literature as the "three C's," **challenge**, **commitment**, and **control**. Research indicates that resilient individuals adjust more readily to change and stressful life circumstances by perceiving change as a *challenge* or opportunity for growth rather than a threat. In addition, resilient individuals are deeply *committed* to the people and activities in which they are involved. Finally, instead of feeling helpless or victimized, they perceive a sense of personal *control* in handling life's events and adversities. The following are brief descriptions of these qualities:

Challenge: Resilient individuals perceive change as an opportunity for personal growth. They rise to the occasion because they view the problem as a challenge rather than a threat to their well-being.

Commitment: Individuals strong in commitment have a sense of meaning and purpose in their work and relationships. They are involved at work and in relationships rather than alienated out of fear, uncertainty, or boredom.

Control: Resilient individuals believe they have influence over their life circumstances, and their behavior reflects this belief. They have an internal sense of personal mastery, confronting problems with confidence in their ability to implement effective solutions, rather than feeling powerless, lacking self-confidence and initiative, and engaging in manipulating behavior.

Transforming Lives Through Resilience Education

To learn more about how you can enhance your personal resilience, we invite you to view our online resilience education training program at this website: http://www.utexas.edu/education/resilience. We offer this program to you at no cost (valued at $80) as a gift for your participation in this study. To activate your free membership, visit the following link, enter your information, and use the group code: **se4n5fcp** (http://www.utexas.edu/education/resilience/users/registerGroupMember). If you have questions about this program, please contact Dr. Mary Steinhardt at msteinhardt@austin.utexas.edu.

POSITIVITY RATIO

Positive Emotions

You completed 10 items that asked about your tendency to experience positive emotions. The Modified Differential Emotions Scale (mDES; Fredrickson et al., 2003) assessed the extent to which you generally experience various positive feelings and sentiments. The higher you scored on this scale, the more frequently you reported experiencing positive emotions in your life. Below are sample items from the positive emotions scale:

- *Hopeful, optimistic, encouraged*
- *Grateful, appreciative, thankful*
- *Inspired, uplifted, elevated*

Positive emotions expand one's scope of attention and cognition, and thus enable more creative, flexible, and engaged thinking. The broadened cognition and engaged attitude consequently promotes successful adaptation to stress, which, over time, builds enduring psychological, physical, and social resources that further enhance resilience and prevent undesirable outcomes.

Negative Emotions

You completed 10 items that assessed how often you experience negative emotions. The mDES (Fredrickson et al., 2003) examined the degree to which you generally experience various negative feelings and sentiments. The higher you scored on this scale, the more frequently you reported experiencing negative emotions in your life. Below are sample items from the negative emotions scale:

- *Irritated, angry, annoyed*
- *Ashamed, humiliated, disgraced*
- *Distrustful, hateful, suspicious*

In contrast to the broadening and building effects of positive emotions, negative emotions tend to narrow one's mindset during stressful situations because of the fight-or-flight response that constricts cognitive capacity, flexibility, and creativity. While this response may be critical during immediate life-threatening situations, this strategy is often maladaptive and harmful in situations that require more time-consuming and thoughtful decisions and actions, such as stressful situations that are always present, persistent, and unrelenting.

Positivity Ratio 3-to-1

Just like how water turns to ice at 0° C (32° F), researchers have found such a tipping point with respect to a person's well-being. Experiencing positive emotions at a ratio of at least 3-to-1 with negative emotions is believed to be the tipping point between human languishing and human flourishing. According to research, individuals who report having positivity ratios greater than 3-to-1 are more resilient to adversity, successful at work, and flourish in life. "With positivity, you'll learn to see new possibilities, bounce back from setbacks, connect with others, and become the best version of yourself" (Fredrickson, 2009).

For more information on the positivity ratio, to see all of the measured emotions, and to learn how you can regularly track and boost your positivity, visit http://www.positivityratio.com/single.php.

WORK ENGAGEMENT

You completed nine items that assessed your level of work engagement, which is defined as a positive work-related state of fulfillment that is characterized by vigor, dedication, and absorption. This variable was measured by the Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2006). Higher scores on this variable indicate higher levels of engagement at work. The higher your work engagement score, the more likely the following statements from the survey describe you:

Vigor
- *At my work, I feel bursting with energy.*
- *At my job, I feel strong and vigorous.*
- *When I get up in the morning, I feel like going to work.*

Dedication
- *I am enthusiastic about my job.*
- *My job inspires me.*
- *I am proud of the work that I do.*

Absorption
- *I feel happy when I am working intensely.*
- *I am immersed in my work.*
- *I get carried away when I am working.*

According to research, work engagement is the antipode to the burnout syndrome which is characterized by feelings of emotional exhaustion, cynicism/depersonalization, and reduced personal accomplishment. In contrast to burned-out workers, engaged employees have an energetic and effective connection with their work activities and see themselves as able to deal well with the demands of their jobs. Because of their vigor, dedication, and absorption toward work, they are satisfied, productive, and successful at their jobs. Rather than a momentary and specific state of mind, engagement is a more persistent and pervasive affective-cognitive state that is not focused on any particular object, event, individual, or behavior. The following are brief descriptions of the three qualities of work engagement:

Vigor is characterized by high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties.

Dedication refers to being strongly involved in one's work and experiencing a sense of significance, enthusiasm, inspiration, pride, and challenge.

Absorption is characterized by being fully concentrated and happily engrossed in one's work, whereby time passes quickly and one has difficulties with detaching oneself from work.

In order to increase your engagement at work, set yourself up for success by ensuring that your work both fits with how you see yourself and is meaningful to you. Additionally, maintain good relations with your coworkers and supervisors, and surround yourself with the resources you need.

JOB PRODUCTIVITY & SATISFACTION

The survey you completed included two items that asked the extent to which you feel productive and satisfied with your job as a whole. Job satisfaction was measured using the single-item Job Satisfaction Scale (JSS; Dolbier et al., 2005). A job productivity question was developed and adapted from the JSS item.

Job satisfaction is defined as feeling pleasure or a positive emotional state, which results from the appraisal of your job experience as fulfilling and ascribing important job values.

Job productivity, on the other hand, is described as having a sense of accomplishment over work duties and responsibilities, and achievement over one's goals and expectations.

These job values and appraisals can be intrinsic (i.e., feeling more confident and successful) and/or extrinsic (i.e., additional pay or enhanced working conditions). The higher your productivity and satisfaction scores, the more likely you were to feel productive and satisfied with your job. Your sense of job productivity and job satisfaction were measured using the following two statements:

- *Taking everything into consideration, how do you feel about your work productivity as a whole?*
- *Taking everything into consideration, how do you feel about your job as a whole?*

Job productivity and satisfaction have inherent values as desired ends in themselves. In addition, job productivity and satisfaction are also valued as means to various ends or outcomes. For example, work-related variables, such as absenteeism, turnover, and job stress, have been shown to be positively influenced by one's perception of job productivity and satisfaction. In a broader sense, job productivity and satisfaction have been related to enhanced quality of life, health, and overall life satisfaction.

GENERAL ANXIETY

The survey you completed included 20 items that asked how you generally felt about yourself, measured by the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1968; 1977). The higher you scored on this variable, the more frequently you experienced feelings of anxiety and the more likely you were to respond "almost always" to the following sample items from the survey:

- *I feel nervous and restless.*
- *I get in a state of tension or turmoil as I think over my recent concerns and interests.*
- *I feel inadequate. I feel like a failure.*
- *I feel that difficulties are piling up so that I cannot overcome them.*

Anxiety is conceptualized in two ways: state anxiety and trait anxiety. State anxiety is described as an unpleasant emotional state or condition, such as feeling nervous or worried about a particular stimulus (e.g., upcoming public speaking task). State anxiety is often transitory, which comes and goes with the stressors, but can span over longer periods of time if the evoking conditions persist. By contrast, trait anxiety refers to stable individual differences between people with regard to their tendency to perceive and appraise stressors as threatening or dangerous. Trait anxiety is one's disposition to respond to stressful situations with varying degrees of state anxiety. Individuals with higher levels of trait anxiety are more likely to respond to stressful situations with higher intensities of state anxiety reactions (e.g., feelings of tension, apprehension, and nervousness). Regardless of the real danger of the stressful circumstance, the individual's perception of threat may have a greater influence on the expressed anxiety state.

The survey items you completed represented measures of trait anxiety; we used this construct because this measure gives us a broader understanding of your proneness to feelings of anxiety in the past, present, and future. Trait anxiety is typically shaped by the frequency and intensity of past experiences, and can predict one's likelihood of experiencing anxiety states in the present and future.

Often the more readily apparent expressions of anxiety are physical responses. Anxiety can be evident in a host of physical problems, including rapid breathing, chest tension, and pain in various parts of the body. Anxiety represents a prolonged stress reaction as the individual's "fight-or-flight" response stays in a hyper-responsive state. Perhaps less obvious are the cognitive and emotional expressions of anxiety. A general feeling of anxiety can result from an inability to put recent concerns out of one's mind after the challenging event has passed. Anxiety can lead to feelings of being overwhelmed or inadequate and pervasive thoughts that one cannot meet the challenges of everyday life. Anxiety is a compelling illustration of the mind-body connection. Negative thoughts and feelings that seem unchangeable are often positively impacted by progress in achieving a physical relaxation response. In the same way, individuals who can positively shape and change their thoughts and emotions experience the benefits of improved health.

According to recent research, having a general/trait anxiety score of **43 or higher** may be a marker for possible presence of anxiety disorders (Van Dam et al., 2011). As this measure is only a screening instrument, and not a diagnostic tool, we strongly recommend that you seek further assessment and evaluation if your individual score was 43 or higher. Please feel free to contact Dr. Mary Steinhardt at 512.567.1204 (cell), msteinhardt@austin.utexas.edu, for assistance. The University's HealthPoint Employee Assistance Program also provides free, confidential counseling for up to six sessions per year with its experienced staff of licensed psychologists and social workers (http://www.utexas.edu/hr/current/services/informational/counseling.html).

DEPRESSIVE SYMPTOMS

Using the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), you completed 20 items that asked about your tendency to experience depressive symptoms. Higher scores on this variable indicate that you reported experiencing higher degrees of depressive symptoms. The higher you scored on this measure, the more likely you were to respond "most or all of the time" on the following sample items from the survey:

- *I was bothered by things that usually don't bother me.*
- *I thought my life had been a failure.*
- *My sleep was restless.*
- *I felt that I could not shake off the blues even with help from my family or friends.*
- *I did not feel like eating; my appetite was poor.*
- *I felt that I was not as good as other people.*
- *I had trouble keeping my mind on what I was doing.*
- *I felt that everything I did was an effort.*
- *I felt hopeless about the future.*

Depression is a very broad term used to describe a host of physical sensations and emotions. Not everyone who feels depressed will experience all of the symptoms, but the depressed individual experiences symptoms at a level that impairs daily functioning and life satisfaction.

Most depressed individuals experience some type of sleep disturbance since sleep is at the foundation of personal well-being. Disturbances of appetite and physical energy are also often evident. The feelings component of depression can be harder to quantify, often simply captured by the phrase, "I just don't feel like myself." Whether feeling sadness, hopelessness, or poor self-image, depression negatively impacts an individual's outlook and the ability to accomplish daily tasks.

Depression is now understood as a physical illness and not just a matter of motivation or personal choice. Improved management of sleep, diet, and exercise invariably improve one's mood. Medication and counseling interventions can also help put depressed individuals back on the road to feeling like themselves again.

According to research, having a CES-D score of **16 or higher** may be a marker for moderate to severe levels of depressive symptoms (Antoni et al., 2001). As this measure is only a screening instrument and not a diagnostic tool, we strongly recommend that you seek further assessment and evaluation if your individual score was 16 or higher. Please feel free to contact Dr. Mary Steinhardt at 512.567.1204 (cell), msteinhardt@austin.utexas.edu, for assistance. The University's HealthPoint Employee Assistance Program also provides free, confidential counseling for up to six sessions per year with its experienced staff of licensed psychologists and social workers (http://www.utexas.edu/hr/current/services/informational/counseling.html).

INFO SESSIONS & CAMPUS RESOURCES

Again, thank you very much for participating in the Postdoctoral Experience & Well-Being Survey. It is our hope that your participation has been personally and professionally beneficial to you. If you have any questions/comments about this project, please contact Dr. Mary Steinhardt at msteinhardt@austin.utexas.edu or Christian Gloria at ctgloria@utexas.edu.

On **April 11 and 16, 2012**, you will have opportunities to attend group information sessions where we will briefly summarize the individual feedback profile you received and answer any questions you may have.

SCHEDULE OF INFORMATION SESSIONS

Please RSVP to Christian Gloria at ctgloria@utexas.edu.

Wednesday • April 11, 2012	**Monday • April 16, 2012**
9:00am – 10:00am • FAC 426	10:00am – 11:00am • FAC 328
2:00pm – 3:00pm • FAC 328	2:00pm – 3:00pm • FAC 328

CAMPUS SERVICES AND OTHER RESOURCES

Office of the Vice President for Research, Postdoctoral Services
Homepage: http://www.utexas.edu/research/about/postdoctoral-fellows
Research Resources: http://www.utexas.edu/research/resources

Office of Sponsored Projects
Contact Information: http://www.utexas.edu/research/osp/about/contact.html

Office of Research Support
Homepage: http://www.utexas.edu/research/rsc/

Office of the University Faculty Ombuds
Homepage: http://www.utexas.edu/faculty/council/ombuds/

Human Resource Services
Homepage: http://www.utexas.edu/hr/index.php

HealthPoint Employee Assistance Program (EAP)
Homepage: http://www.utexas.edu/hr/current/services

School of Biological Sciences Postdoc Association
Homepage: http://w3.biosci.utexas.edu/postdoc/

National Postdoctoral Association
Homepage: http://www.nationalpostdoc.org/

University Health Services
Homepage: http://healthyhorns.utexas.edu/
Counseling & Mental Health Center: http://www.cmhc.utexas.edu/facultyandstaff.html
Recreational Sports: http://www.utrecsports.org/memberships/facultystaff/facstaff.php

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Appendix F: Approval from the Institutional Review Board

OFFICE OF RESEARCH SUPPORT

THE UNIVERSITY OF TEXAS AT AUSTIN

P.O. Box 7426, Austin, Texas 78713 · Mail Code A3200
(512) 471-8871 · FAX (512) 471-8873

FWA # 00002030

Date: 12/16/11

PI: Mary A Steinhardt

Dept: Kinesiology and Health Educati

Title: Determinants of successful postdoctoral experiences

Re: IRB Expedited Approval for Protocol Number 2011-11-0018

Dear Marv A Steinhardt:

In accordance with the Federal Regulations the Institutional Review Board (IRB) reviewed the above referenced research study and found it met the requirements for approval under the Expedited category noted below for the following period of time: 12/16/2011 to 12/15/2012 . *Expires 12 a.m. [midnight] of this date.*

Expedited category of approval:

☐ 1) Clinical studies of drugs and medical devices only when condition (a) or (b) is met. (a) Research on drugs for which an investigational new drug application (21 CFR Part 312) is not required. (Note: Research on marketed drugs that significantly increases the risks or decreases the acceptability of the risks associated with the use of the product is not eligible for expedited review.)
(b) Research on medical devices for which (i) an investigational device exemption application (21 CFR Part 812) is not required; or (ii) the medical device is cleared/approved for marketing and the medical device is being used in accordance with its cleared/approved labeling.

☐ 2) Collection of blood samples by finger stick, heel stick, ear stick, or venipuncture as follows: (a) from healthy, non-pregnant adults who weigh at least 110 pounds. For these subjects, the amounts drawn may not exceed 550 ml in an 8 week period and collection may not occur more frequently than 2 times per week; or (b) from other adults and children, considering the age, weight, and health of the subjects, the collection procedure, the amount of blood to be collected, and the frequency with which it will be collected. For these subjects, the amount drawn may not exceed the lesser of 50 ml or 3 ml per kg in an 8 week period and collection may not occur more frequently than 2 times per week.

☐ 3) Prospective collection of biological specimens for research purposes by non-invasive means. Examples:
(a) Hair and nail clippings in a non-disfiguring manner.
(b) Deciduous teeth at time of exfoliation or if routine patient care indicates a need for extraction.
(c) Permanent teeth if routine patient care indicates a need for extraction.
(d) Excreta and external secretions (including sweat).

(e) Uncannulated saliva collected either in an un-stimulated fashion or stimulated by chewing gumbase or wax or by applying a dilute citric solution to the tongue.
(f) Placenta removed at delivery.
(g) Amniotic fluid obtained at the time of rupture of the membrane prior to or during labor.
(h) Supra- and subgingival dental plaque and calculus, provided the collection procedure is not more invasive than routine prophylactic scaling of the teeth and the process is accomplished in accordance with accepted prophylactic techniques.
(i) Mucosal and skin cells collected by buccal scraping or swab, skin swab, or mouth washings.
(j) Sputum collected after saline mist nebulization.

☐ 4) Collection of data through non-invasive procedures (not involving general anesthesia or sedation) routinely employed in clinical practice, excluding procedures involving x-rays or microwaves. Where medical devices are employed, they must be cleared/approved for marketing. (Studies intended to evaluate the safety and effectiveness of the medical device are not generally eligible for expedited review, including studies of cleared medical devices for new indications).
Examples:
(a) Physical sensors that are applied either to the surface of the body or at a distance and do not involve input of significant amounts of energy into the subject or an invasion of the subject's privacy.
(b) Weighing or testing sensory acuity.
(c) Magnetic resonance imaging.
(d) Electrocardiography, electroencephalography, thermography, detection of naturally occurring radioactivity, electroretinography, ultrasound, diagnostic infrared imaging, doppler blood flow, and echocardiography.
(e) Moderate exercise, muscular strength testing, body composition assessment, and flexibility testing where appropriate given the age, weight, and health of the individual.

☐ 5) Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for non-research purposes (such as medical treatment or diagnosis).
Note: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(4). This listing refers only to research that is not exempt.

☐ 6) Collection of data from voice, video, digital, or image recordings made for research purposes.

☒ 7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.
Note: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt.

☒ Use the attached approved informed consent document(s).

☒ You have been granted a Waiver of Documentation of Consent according to 45 CFR 46.117 and/or 21 CFR 56.109(c)(1).

☐ You have been granted a Waiver of Informed Consent according to 45 CFR 46.116(d).

Responsibilities of the Principal Investigator:

1. Report immediately to the IRB any unanticipated problems.

2. Submit for review and approval by the IRB all modifications to the protocol or consent form(s). Ensure the proposed changes in the approved research are not applied without prior IRB review and approval, except when necessary to eliminate apparent immediate hazards to the subject. Changes in approved research implemented without IRB review and approval initiated to eliminate apparent immediate hazards to the subject must be promptly reported to the IRB, and will be reviewed under the unanticipated problems policy to determine whether the change was consistent with ensuring the subjects continued welfare.

3. Report any significant findings that become known in the course of the research that might affect the willingness of subjects to continue to participate.

4. Ensure that only persons formally approved by the IRB enroll subjects.

5. Use only a currently approved consent form, if applicable.
   Note: Approval periods are for 12 months or less.

6. Protect the confidentiality of all persons and personally identifiable data, and train your staff and collaborators on policies and procedures for ensuring the privacy and confidentiality of subjects and their information.

7. Submit a Continuing Review Application for continuing review by the IRB. Federal regulations require IRB review of on-going projects no less than once a year a reminder letter will be sent to you two months before your expiration date. If a reminder is not received from Office of Research Support (ORS) about your upcoming continuing review, it is still the primary responsibility of the Principal Investigator not to conduct research activities on or after the expiration date. The Continuing Review Application must be submitted, reviewed and approved, before the expiration date.

8. Upon completion of the research study, a Closure Report must be submitted to the ORS.

9. Include the IRB study number on all future correspondence relating to this protocol.

If you have any questions contact the ORS by phone at (512) 471-8871 or via e-mail at orsc@uts.cc.utexas.edu.

Sincerely,

James P. Wilson

James Wilson, Ph.D.
Institutional Review Board Chair

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Vita

Christian Tolentino Gloria was born in Malolos, Bulacan, Philippines in 1981, and he moved to the United States in 1993. He entered The University of Texas at Austin in August 2001, where he later received his Bachelor of Science in Health Promotion & Fitness in December 2005, as well as his Master of Arts in Health Education in May 2009. During his time as a graduate student at UT Austin, Christian was the recipient of the University Continuing Fellowship, the George I. Sánchez Endowed Presidential Fellowship, the Ellis Graduate Scholarship, the Professor & Mrs. Karl K. Klein Endowed Graduate Scholarship, and the Hoelting Team Player Award. In the summer of 2012, Christian relocated to Honolulu, Hawaii with his two daughters (Luna & Kira, cairn terriers) to begin his new career as an Assistant Professor of Health Sciences at Hawaii Pacific University.

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